MARINE REVIEW

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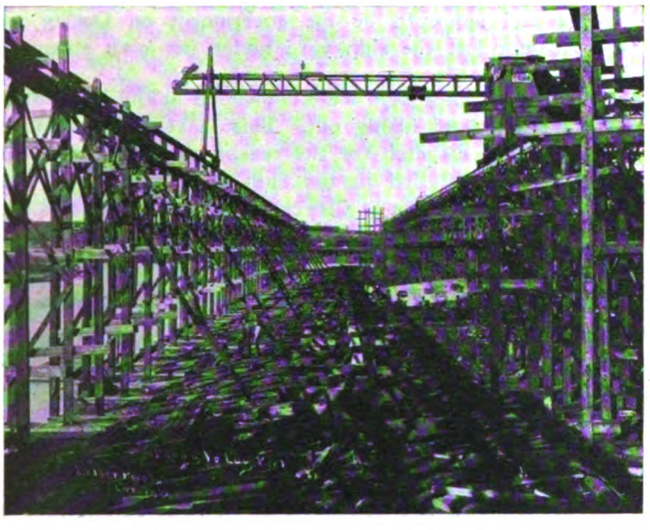
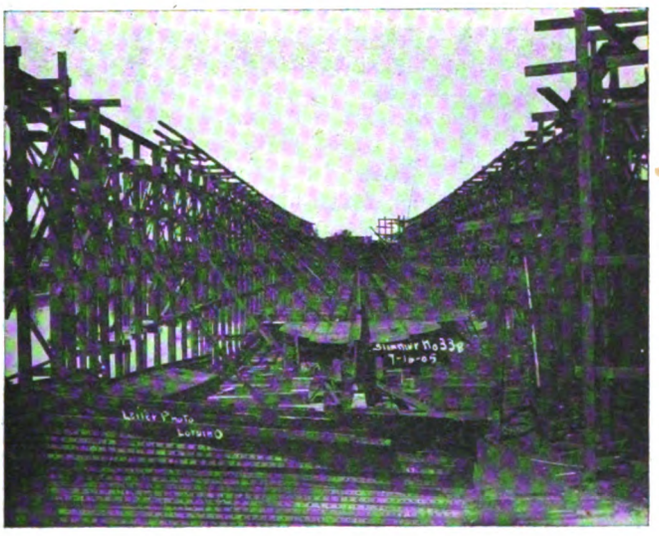
BUILDING A SHIP COMPLETE IN SEVENTY DAYS

When Capt. Charles L. Hutchinson gave the contract to the American Ship Building Co. for the construction of the steamer John Stanton it was for 1906 delivery. The Stanton was the first vessel to be ordered for 1906 delivery, but to the surprise of every one this order was followed by twenty-five others, of which the American



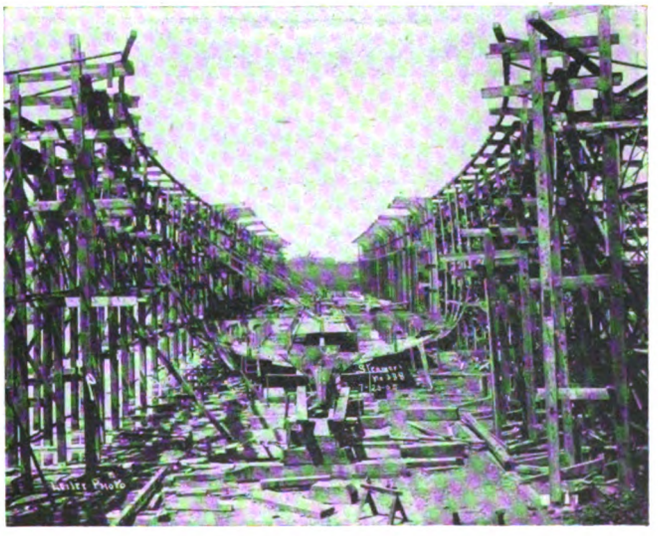
THE KEEL BLOCKS IN PLACE FOR LAYING KEEL OF STEAMER JOHN STANTON.

Ship Building Co. secured twenty, the Great Lakes Engineering Works four, and the Craig Ship Building Co. one. The American Ship Building Co. concluded that it better deliver the Stanton during 1905, and it has certainly made a phenomenal record in the construction of the ship. The keel was laid on July 13 and the steamer began her maiden trip on Oct. 10, the time elapsed being three days less than three months. Subtracting Sundays, Labor Day, six half holidays and two days of bad weather during which no work was done, the ship was constructed complete, machinery installed and steam up in seventy working days. No overtime whatever was allowed. A slight delay was caused by a strike among the heater boys in the riveting department. The work was done at the Lorain yard of the company and was under the general supervision of Supt. Frank La Marche. The chronology of such a performance becomes extremely interesting. As



STEAMER JOHN STANTON JULY 16.

stated, the keel was laid on July 13; the stem was set on Aug. 1; all arches were in place on Aug. 8; the stern post set on Aug. 9; the fan tail in place on Aug. 10 and the hull



STEAMER JOHN STANTON JULY 23.

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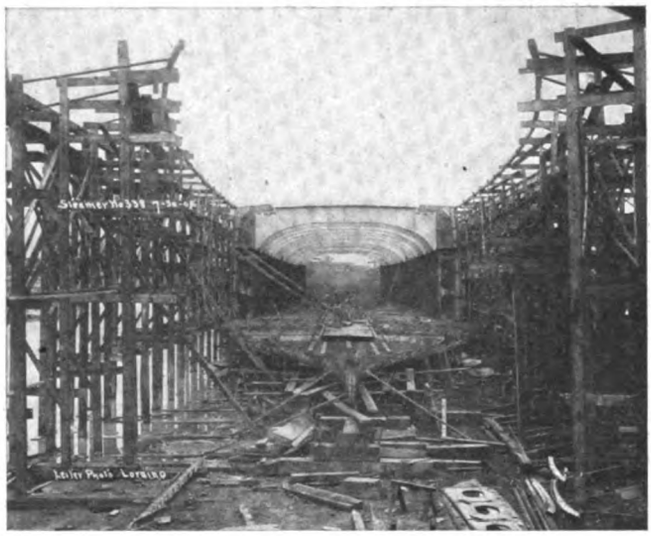
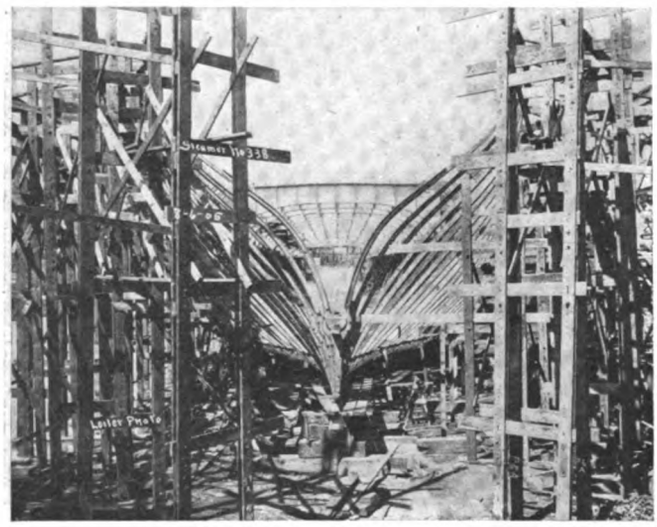


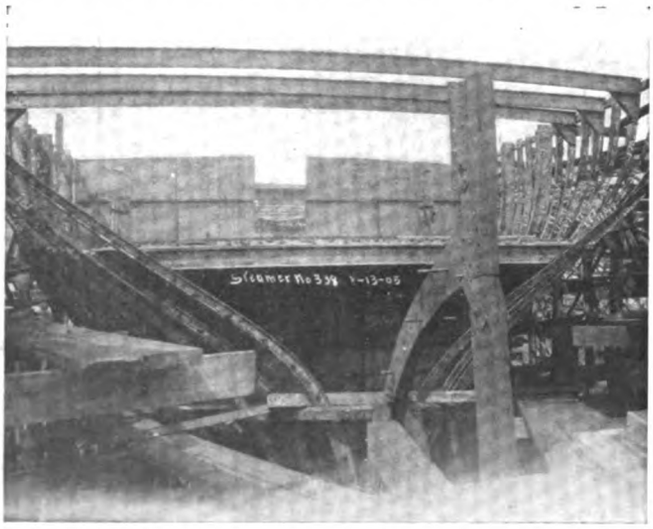
STEAMER JOHN STANTON JULY 30.

was launched on Sept. 16. The bed plate and crank shaft air pump and channel brake, were in place on Sept. 18;



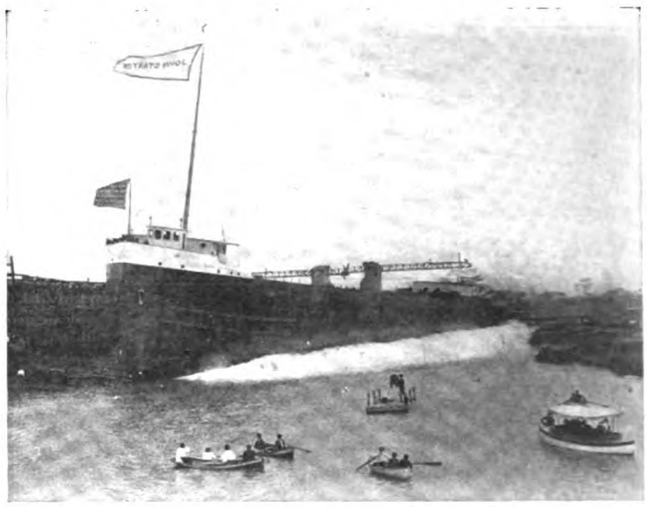
STEAMER JOHN STANTON AUG. 6.

the condenser, three back columns, two connecting rods, four front columns, reverse shaft, air pump beams, high



STEAMER JOHN STANTON AUG. 13.

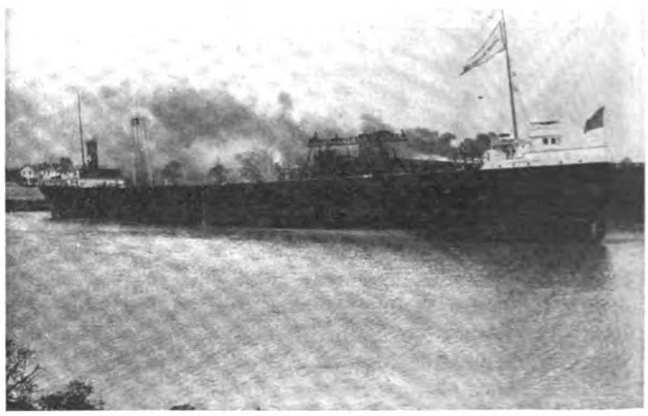
pressure valve gear, high, low and intermediate cylinders, were put aboard on Sept. 19; valve stems and brackets, eccentric rods, reach rods, etc., throttle valve, high, low and intermediate exhaust pipes and three pistons and covers were put aboard Sept. 20; the steamer was shifted astern to boiler room, rigging put aboard to move boilers and starboard boilers installed on Sept. 21; the port boiler was put aboard, both boilers set, the gear for moving starboard boiler removed and hatch gear installed on Sept 22; the britchen and fan were put aboard Sept. 23; and stop valves, main steam line; the smoke stack was put in place Sept. 26; the main mast shipped Sept 27; quadrant, main steam line from boiler to slip joint, Sept. 28. The vessel was in-



LAUNCH OF THE STEAMER JOHN STANTON SEPT. 16.

spected and approved by the government on Oct. 5 and the steamer left the ship yard under her own steam on Oct. 10.

Twenty working days were consumed in the installation of machinery and fitting out. This is regarded as most extraordinary dispatch for the reason that while the machinery was installed in the ship at Lorain, the boiler shop and foundry are at Cleveland and the templates had



STEAMER JOHN STANTON LEAVING ON HER MAIDEN TRIP OCT. 10.

to be shipped to Cleveland to be molded and cast and returned to Lorain for finishing. Owing to this condition of affairs there was no opportunity for preliminary work such as putting the machinery together, prior to installing it. Each part of the engine, numbering in all 200 pieces, had to be lifted in separately. Everyone at the Lorain yard from Supt. La Marche down was tremendously interested in this work upon the Stanton and are justly proud of the record achieved. Especial credit is due to A. C. Payton, assistant superintendent; Charles Henderson,

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master mechanic; John Kelley, boat foreman and to Theodore Wehagan, joiner foreman, who inspired their various departments with their own zeal.

The Stanton is 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep. She is of arch construction with a straight hopper, having thirty hatches, spaced 12-ft. centers. Her engines are 23½, 38 and 63 in. cylinder diameters by 42 in. stroke, supplied with steam from two Scotch boilers, 14 ft. 6 in. by 11 ft. 6 in., equipped with Ellis & Eaves draft and allowed a pressure of 180 lbs. She is designed to carry 9,000 tons of ore.

PANAMA CANAL MACHINERY CONTRACTS.

Washington, Oct. 28.—The Panama Canal Commission has within the past few days, awarded contracts for machinery and equipment which aggregate in the neighborhood of $1,000,000. Perhaps the most important single contract was that for nineteen 70-ton steam shovels which was awarded to the Bucyrus company, of South Milwaukee, Wis., on their bid of $10,240 each, or $194,560 for the entire contract.

The bidders and their bids (per shovel) were as follows: Marion Steam Shovel Co., Marion, Ohio, $10,450; Atlantic Equipment Co., New York City, $11,750; Allis-Chalmers Co., Milwaukee, Wis., $9,400; Bucyrus Co., South Milwaukee, Wis., $10,240.

In explanation of the failure of the lowest bidder to secure the contract in this instance it may be pointed out that the Allis-Chalmers Co.'s proposal did not contemplate the payment by the bidder of any freight charges whatever, any expense of erecting the shovels or any expense connected with the testing of same. On the other hand the Bucyrus company whose proposal was accepted merely asks the government to supply the unskilled labor needed for the erection and test of the shovels, and offers to make a considerable reduction from the contract price if the government will furnish all labor for the erection of the machines.

Another contract placed was for six 60-ton unloaders. This went to the Lidgerwood Manufacturing Co., of New York City, the only bidders and whose proposal calls for $7,949 each, or $47,694 for the lot.

Contract for twelve unloading plows went to the Marion Steam Shovel Co., of Marion, Ohio, the only bidder in this class. The price accepted was $900 each, or $10,800 for the entire contract.

The United States Steel Products Export Co., of New York city, was awarded three contracts by the canal commission. They took an order for 40,000 lbs. of track bolts at $1,040; an order for 200,000 lbs. of railroad track spikes at $3,910; and an order for 100,000 tie plates at $6,570.

The Morden Frog & Crossing Works, of Chicago, secured two awards—one for 25,000 drop forged steel braces at $2,312.50, and the other for 150 switches for $5,250.

R. C. Horton, of Chicago, secured three contracts. He agrees to furnish a steel water tank of 500,000 gallons capacity, for use at Mt. Hope, in the canal zone, for the sum of $9,950, for one steel water tower and tank for Colon, with a capacity of 400,000 gallons, his accepted bid was $22,700; and for one steel water tower and tank for Culebra, capacity 50,000 gallons, his figure was $3,400. Other bidders on these contracts were the Riter-Conley Manufacturing Co., of Pittsburg, Pa., and Tippett & Wood, of Phillipsburg, N. Y. The Riter-Conley Co. asked $14,451 for the 500,000 gallon tank, $27,763 for the 400,000 gallon tank and tower; and $5,190 for the 50,000 gallon tank and tower. Tippett & Wood offered a proposal of $14,647 for the 500,000 gallon tank; $24,142 for the 400,000 gallon tank and tower, and $3,800 for the 50,000 gallon tank and tower if awarded in conjunction with one of the other contracts, or $4,900 if awarded singly.

A contract for six earth spreaders of iron and steel construction went to the Mann & McCann Co., of Chicago., Ill., on their bid of $23,382. The only competitive bid in this class, $36,000 in amount, was offered by the O. F. Jordan Co., Chicago.

The engineer department of the Canal Commission has just asked for 100 steel sheets each, of Nos. 10, 12, 14, 16, and 18, all to be 36 x 72 in. in size, and bids will be invited in the near future. Bids for other items of considerable importance are also to be advertised for at no distant date.

PRIVATE CONTRACT WORK ON PANAMA CANAL

Washington, Oct. 28.—The authoritative announcement that United States Government will enter into contracts with corporations or individuals for the construction of the Panama canal or any part of it, for which bidder may submit satisfactory proposals is full of significance for machinery manufacturers, iron and steel men and firms in equipment and supply lines in general. It is well known that the conditions governing the sale of supplies to the government under strictly competitive conditions are not always the same as those prevailing when purchases are made by private contracting firms, some of which have more or less close relations with certain manufacturers or jobbers.

Thus far all purchases made for the canal work—and they have embraced everything from steam shovels to small hardware—have been made outright by the Canal Commission. This equipment has been obtained merely for what might be termed experimental work. It was necessary for the government officials to personally direct a certain amount of work in order that they might obtain at first hand definite knowledge as to the work to be performed and conditions in general which would enable them to pass intelligently upon bids submitted by prospective contractors, and to draw up contracts that would cover all points. Now that this practical experience has been obtained, or bids fair to be, in the near future, plans are being made looking to the issuance of calls for bids, and proposals will probably be invited soon after it is definitely determined what type of canal shall be constructed.

A number of firms have already given assurances that they will offer bids, among the number being the Atlantic, Gulf & Pacific Co., which is carrying out extensive harbor improvements at Manila, and is building two large dredges for government work on the terminals of the canal. None of the prospective bidders have, however, stated that they will seek a contract for the entire project, and there is growing doubt in government circles whether any private firms will be anxious to undertake the excavation of the Culebra cut. It is not that the work of excavation is so difficult, but the disposition of the excavated material presents problems which many contractors appear to regard as formidable.

BIDS FOR NAVY YARD SUPPLIES

Washington, Oct. 28.—The proposals opened this week by the bureau of supplies and accounts, of the navy department, contained very few items of interest to iron and steel and kindred trades.

In the class calling for one pipe-bending machine for the League Island navy yard, there was only one bidder. The Manhattan Supply Co., of New York, which submitted a proposal of $99.50. Likewise a single bidder, the Hyde Windlass Co., of Bath, Me., entered a proposal for three steam windlasses. The bid was $1,650.

For one wood-turning lathe for the Norfolk navy yards the bids were: Oliver Machinery Co., Grand Rapids, Mich., $280; Smith-Courtney Co., Richmond, Va., $279.

For 108,750 lbs. of steel rods the proposals were: Crucible Steel Co. of America, Pittsburg, Pa., $4,615.02; J. B. Kendall, Washington, D. C., $5,255.50.

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A REVERSIBLE PROPELLER

A reversible propeller for use in boats fitted with internal combustion engines is shown in the accompanying illustrations. It was designed by W. E. Geyer, Cambridge, Mass. The propellers are made both with two and with three blades, the blades being pivoted upon the boss. The blades can be rotated and their angle relative to the shaft can be changed by means of a sliding piece. In the case of a propeller fitted with three blades the change in the inclination of the blades is accomplished by means of gears. The blades are set in a solid hub with a semicircular overhung rabbet, as shown in Figs. 1 and 2.

The hub slides longitudinally upon the propeller shaft. In each rabbet a slot A is cut which goes through to the

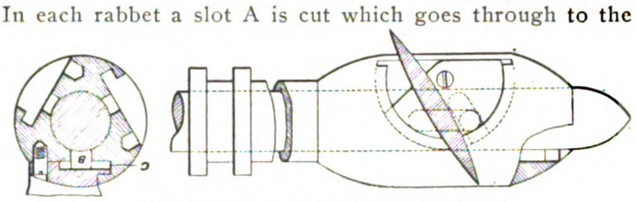


FIG. 1. GEYER REVERSIBLE PROPELLER.

shaft. A pin B projects from the shaft through this slot and engages in a slot C cut in the propeller boss. The propeller flange is pivoted to the hub by means of a set of screws as shown in the end view of the hub in Fig. 1. When the propeller boss is moved longitudinally on the shaft the pin B engages with the slot C and will rotate the flange about this set screw. The blade is cast in one integral part with the flange and rotates with the latter. Its angle of inclination, therefore, can be reversed by sliding the propeller boss along the shaft as desired.

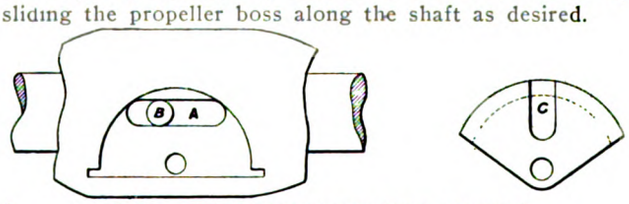
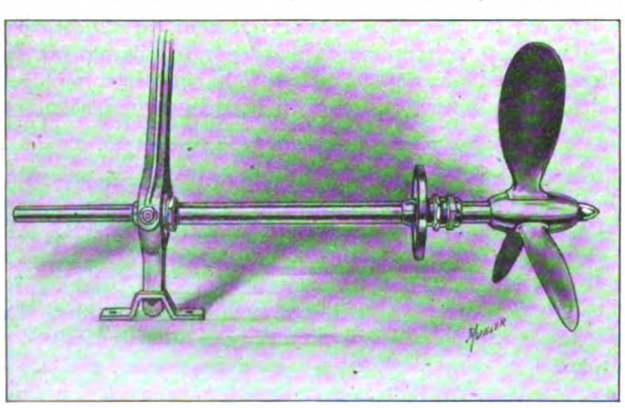


FIG. 2. HUB OF GEYER REVERSIBLE PROPELLER

The center of pressure of the blade lies between the set screw and the sliding pin. Thus the thrust of the propeller is divided between the two, the greater portion being taken by the pin which is an integral part of the shaft. But a small fraction of the total thrust is transmitted to the boss and through it to the reversing force. This enables a solid shaft to be used instead of the hollow shaft which is usual in a reversible propeller.

The maker states that the main features of this propeller are strength, reliability and ease of operation. The



GEYER REVERSIBLE PROPELLER.

blades are cut to a standard gauge, each being of the same weight. They form a perfectly true screw and balanced propeller. The hubs, blades and stuffing boxes are made of a good quality of bronze and are highly finished. The shafts are made of Tobin bronze. These propellers are made regularly in sizes from 4 in. to 24 in., larger sizes being made to order.

MARINE METALLIC BOILER COMPOUND

The Bird-Archer Co. of New York and San Francisco has placed on the market a marine metallic boiler compound which has met with much success on the great lakes. Very exhaustive tests have been carried on during the past season on the great lakes in the boilers of some of the Pittsburg Steamship Co.'s vessels, Corrigan, McKinney & Co.'s fleet and the Ceveland & Buffalo steamers—with most flattering results, especially in the latter vessels where the test has been watched with great care.

On April 5 they began using the Bird-Archer marine metallic compound. The boilers of the ships were washed out the latter part of May showing a decided decrease of scale which had formed in the boilers the year before. There had absolutely been no new scale formed on the tubes that had been put into the boilers before the steamer started on this season's work, nor had any scale formed on the parts of the boilers that had been cleaned. A month later the opening of the boilers showed a still greater improvement. In fact, the improvement was so great that the chief engineer decided not to open the boilers for eight weeks. This was something that had never been done before, as in seasons past they always opened their boilers from three to four weeks for washing out.

Upon opening the boilers on Oct. 9 on the City of Erie, the boilers were found vastly improved over the former opening, and on the City of Buffalo, a day later, the same conditions existed.

The Bird-Archer people claim that it will not be necessary for the Cleveland & Buffalo Transportation Co. to open their boilers for cleaning but once next season. This is made possible by the use of their boiler compound, and by a blow-off tube which Chief Engineer Rendall of this line has invented. It has assisted the compound wonderfully in removing the scale that had been thrown down, and the mud that accumulated in the boiler from the use of the Cleveland and Buffalo river water. This in itself will be a great saving to this company in time and coal, as well as having the satisfaction of knowing that their boilers are free from scale, and are being gradually preserved by the formation of an amalgam, which forms over the interior surface of the boiler below the water line.

There is no trace of scale on the tubes put in this year. This is considered a great card for the compound, for in years past, and using other compounds, by this time in their season's run they usually found from ⅛ to ¼ in. of this destructive stuff on the tubes or staybolts that may have been put in new at the beginning of the season.

It certainly must be gratifying to the owners of steam craft that ply the great lakes, to know that there has been such a valuable discovery made in the shape of a marine metallic boiler compound, that will remove the scale from boilers, do away with the necessity of cleaning, and form this protective coating, which will preserve their life, they deriving from this a saving in coal and repair bills.

In order to introduce the Jamaica banana in London, Elders & Tyffes, Ltd., upon the arrival of their steamer Chickahominy at Avonmouth, dispatch a special train to London with 14,000 bunches of bananas. The bananas were loaded into 100 vans and in a parade extending some half a mile in length crossed through a considerable part of the metropolis. The procession attracted a great deal of attention. It was projected for the purpose of showing how amply the bananas could be distributed to dealers.

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NOVEMBER 2, 1905.

The publication of the Marine Review at present is attended with some difficulty, and the present Engineers' Number is by no means complete. On Monday morning last the printers engaged in getting out the Marine Review and other publications of the Penton Publishing Co. struck for an eight-hour day, higher wages and the closed shop. As this company has advocated the open shop for a great many years it cannot now accede to the demand of the union for a closed one. We believe that employers generally should have the right to conduct their own business. The sudden withdrawal of the operating force has crippled us somewhat, but we do not believe it necessary to even ask the indulgence of our patrons. We promise to do the best we can under the circumstances, confident of ultimate success.

There is to be noted throughout the country a general revival in the question of shipping. Newspapers, regardless of party, are discussing the question. The mere fact that they are discussing it is helpful, regardless of the fact that some of them are opposed to governmental support to shipping in the foreign field. They serve by their arguments to bring the question before the people and to get the people thinking. Honest differences of opinion are always to be welcomed. For ourselves we believe that there never can be an adequate fleet flying the American flag and engaged in foreign trade until the handicaps which have been imposed upon shipping by congress are removed. All that the American ship asks and all that it should have, is a fair chance. It has not got that chance now. So long as the United States remains a protective country it should protect all of its industries. It should not exempt a single one of them because it stands to reason that so long as protection advances the general cost of things, higher wages and higher price of material, it must cost more to build a ship in the United States than it does abroad, and by the same token, more to operate it after it is built.

The season on the great lakes, which is just now drawing to a close, has been the most phenomenal in the history of the lakes. It is unfortunate that there is no measure of the port to port commerce of the great lakes that is even approximate in its estimate. The one assurance we have of the the enormous volume of freight transported along the chain of great lakes is the absolute record kept by the superintendent of the Sault Ste Marie Canal. By the time the year is closed nearly forty million tons of freight will have been transported through these canals, most of it, of course, beng east bound traffic. The ease with which this enormous traffic has been handled is astonishing. The season was projected early by the vessel owners but nature put a stop to it by locking the fleet in ice above St. Mary's river. Notwithstanding delays, however, the traffic has been readily handled not only by the ships but by the shipping and receiving docks as well. Dispatch, in fact, continued excellent until September, when the railways which had always kept a good supply of cars on hand began to divert them into other channels. The general transfer of freight took a big jump throughout the entire country during the latter part of September and the railways found themselves with hopelessly inadequate car supply, notwithstanding the fact that during the past two years they have been generously adding to their equipment. The country in general is now transacting a tremendous volume of business.

While the wastage of the elements during the year has been considerable in the mere number of craft destroyed, it has been really inconsiderable in actual tonnage eliminated. The ship yards of the great lakes have orders for twenty-five ships for next year's delivery, any six of which is ample to replace the tonnage destroyed by the elements during the present season.

The steamship Siberia which recently brought Mr. E. H. Harriman, president of the Southern Pacific Railway, and Miss Alice Roosevelt from Japan made a record-breaking trip between Yokahama and San Francisco. Her exact time was ten days, ten hours and twenty-eight minutes

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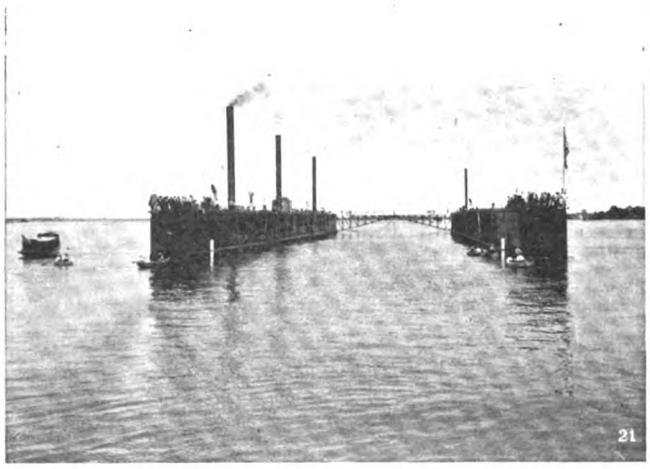
TESTS OF THE CAVITE STEEL FLOATING DRY DOCK

By Civil Engineer A. C. Cunningham, U. S. Navy, Member.

In the early part of June, 1905, the Maryland Steel Co. reported the Cavite self-docking steel floating dry dock ready for test, having completed the same in one month's less time than the twenty-seven allowed by the contract. As in the case of the government floating dock at New Orleans, built by the same company, the Cavite dock was constructed in a shallow basin, and on completion the basin was flooded and the cofferdam at the entrance removed. While flooding the

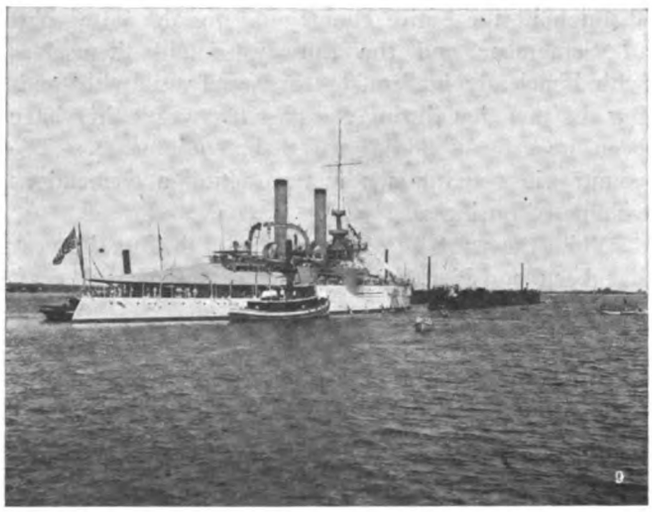


DOCK SUNK READY TO RECEIVE SHIP.

basin the valves of the dock were left open and the dock allowed to fill, so that it continued to rest on the pile and timber foundation on which it was built until the time selected for floating and towing it to the mouth of the Patuxent river, the place selected for test.

When the dock rose from its timber bed it was christened the *Dewey,* after the admiral of the navy, by Miss Grace Endicott, the daughter of Rear Admiral M. T. Endicott, chief of the bureau of yards and docks, navy department, under whose administration the dock had been built, and who represented the navy department when the dock was floated.

In the preliminary test of the New Orleans floating dock a collier of 6,000 tons displacement was used. The increased



THE UNITED STATES BATTLESHIP IOWA ENTERING DOCK.

confidence in this class of dock for warships, and in the *Dewey* dock in particular, is shown by the fact that one of the latest and heaviest ships, the armored cruiser *Colorado,* was selected for the preliminary test.

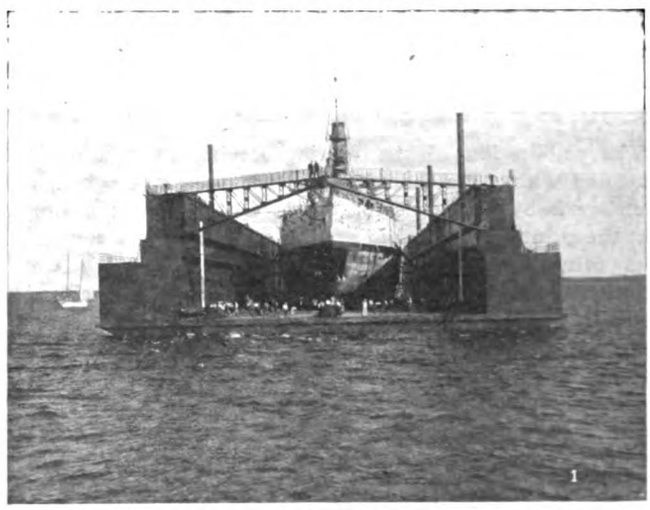
*Journal American Society of Naval Engineers.

Before docking the *Colorado,* the dock was sunk to 29 feet draught over the keel blocks and then pumped up light to a freeboard of 2½ feet. The sinking was accomplished in 1

THE UNITED STATES BATTLESHIP IOWA CENTERED AND READY FOR LIFTING

hour and 36 minutes and the pumping in 1 hour and 2 minutes, showing that the dock is of very rapid action. On this test it was also demonstrated that little or no trimming was required, the dock sinking and rising practically level with all valves open.

The United States ship *Colorado* was docked on June 23, 1905, having a displacement of 13,300 tons at that time. The main and docking keel blocks were all set at the same height. In this preliminary test no effort was made to secure speed, and one-half hour was used in making flushing and fire connections. The elapsed time from when the ship landed on the blocks until the keel came out of water was two hours and



THE UNITED STATES BATTLESHIP IOWA COMPLETELY DOCKED.

sixteen minutes. Pumping was continued until the dock had a uniform freeboard of 2½ feet, only enough excess of water being retained in the side walls and end compartments to give the necessary trim. The *Colorado* was carried on the dock about twenty-four hours without changing the water ballast. When the dock had reached a freeboard of 2½ feet with the *Colorado,* the deflection on the main keel line in the 500 feet of length of the dock was about one-quarter of an inch; after about twenty-four hours the deflection in 500 feet increased to about 1 1-16 in. After undocking the *Colorado* the dock was found to have practically straightened without retaining any set.

After the undocking of the *Colorado,* deflection observations were continued for three days, and variations in deflections

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THE ARMORED CRUISER COLORADO, ENTERING DOCK.

with the dock unloaded, due to temperature changes, of seven-eighths of an inch were noted.

The battleship *Iowa* was docked on June 27, 1905, for a record test, having a displacement of 11,600 tons at the time, and was carried on the dock for forty-eight hours. The specifications required that a 16,000-ton ship should be raised in four hours from the time the ship took the blocks until the keel was out of water. For the equivalent of a 16,000-ton ship the dock was pumped to a freeboard of 4½ feet. From the time the *Iowa* took the blocks until the keel was out of water was 1 hour and 37 minutes; to the time the dock had a freeboard of 4½ feet, 2 hours and 42 minutes. During the docking of the *Iowa* one of the three pumping engines was out of commission for 42 minutes with a slipped eccentric, so that the actual time of operation of the dock is about half that allowed by the specification.

The *Iowa* was docked by uniform pumping, as in the case of the *Colorado,* and carried for forty-eight hours without change of water ballast in the dock. The specification required that when a ship had been docked by uniform pumping until the dock had a freeboard of 2 feet, the deflection in the entire 500 feet of length of the dock should not exceed 3 inches. When the dock reached a freeboard of 4½ feet with the *Iowa,* the deflection was about 2 inches. During the first 24 hours, the dock remaining uniformly pumped, the deflection increased to 4 inches in the 500 feet, and during the second 24 hours showed a recovery to 3⅜ inches.

Immediately following the undocking of the *Iowa* the dock was pumped up to the same depth of water in the compartments as when the ship was docked, which gave a freeboard of 9 feet 6 inches, and it was found that the dock had a hog of 1 inch. During the night this hog disappeared, and early the next morning was a half inch sag. The greatest deflection in the bearing length of the *Iowa* while carried on the dock was about 1¾ inches. The deflection observations indicate that there was no permanent set caused by the docking, and that temperature variations may cause considerable hog or sag.

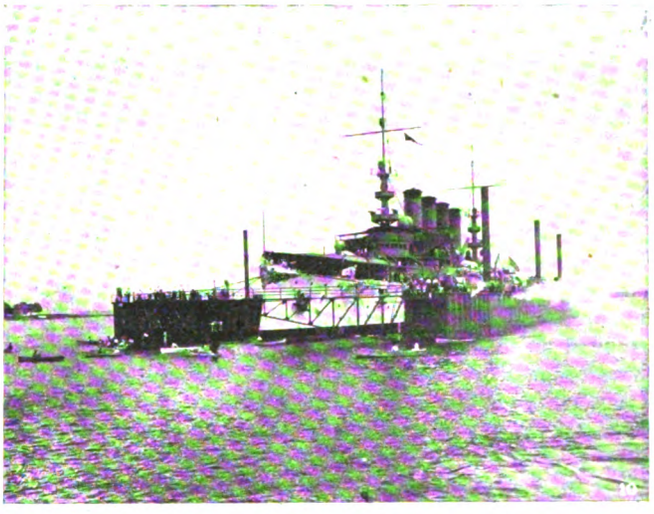
After the undocking of the *Colorado* the main and docking keel blocks were found to be uniformly indented about one-sixteenth of an inch with no crushing. No change was made in the blocks for the *Iowa,* and after undocking she was found to have rested even more easily than the *Colorado.*

With two feet of freeboard and 1 foot of water remaining in the pontoons the carrying capacity of the dock is 18,500 tons, and a 20,000-ton ship could readily be docked with sufficient freeboard to admit of easily working on its bottom.

The results of the docking tests with the *Dewey* dock show that it is considerably in excess of the contract requirements in strength, time of operation and capacity, and is in all respects a very noticeable advance on all floating dry docks which have been so far projected or built. The greatest innovation is the requirement of uniform pumping. This not only insures safety from careless or unskilled handling, but makes it possible to dock nearly all ships with keel straight, or with as much hog or sag as circumstances may render desirable, by suitably distributing the water ballast in the dock. The ship may be also hogged or sagged while on the dock, should occasion arise for so doing. With 30 feet of water over 4 feet keel blocks the side walls of the dock have a freeboard of 11 feet. By taking the keel blocks down to 2 feet and sinking until the side walls have a freeboard of 3 feet, 40 feet of water may be had over the blocks, so that a ship may be taken into the dock in any condition of disablement.

Although a heavier ship, the deflections with the *Colorado* were less than with the *Iowa,* on account of the much longer bearing length of the *Colorado's* keel. With the uniform pumping the strains caused by the *Iowa* were much greater than will be caused by any other ship in the service, projected or built; so that the dock has had the most severe test that can be imposed on it.

The dock was constructed under the supervision of Civil Engineer Leonard M. Cox, U. S. N., and tested by a board of naval officers, consisting of Capt. Adolph Marix, senior



ARMORED CRUISER COLORADO CENTERED AND READY FOR LIFTING.

member; Naval Constructor J. H. Linnard, Commodore J. F. Parker, Com'dr. W. F. Worthington, Naval Constructor J. H. Rock, Civil Engineer A. C. Cunningham and Assistant Civil Engineer J. S. Shultz. The board was assisted in the tests by Civil Engineer Cox.

THE SELF DOCKING TESTS OF STEEL FLOATING DRY DOCK

By Civil Engineer Leonard M. Cox, U. S. Navy.

In the specifications forming a part of the contract between the government and the Maryland Steel Co., for the construction of the steel floating dry dock for Cavite, P. I., it is provided that the structure, after completion, shall be given a thorough working test before final acceptance. This test, as provided for in the contract and its specifications, comprises three distinct operations. The lifting, within a given time, to a specified freeboard, and with limited deflections of the heaviest type of cruiser; the lifting, under similarly specified conditions, of the heaviest battleship; and finally, the lifting of its own hull clear of water.

On June 10, 1905, the dock was launched from the building basin at the manufacturers' works, and was immediately towed to the mouth of the Patuxent river, the site selected for the official tests. After preliminary trials of

*Journal American Society of Naval Engineers

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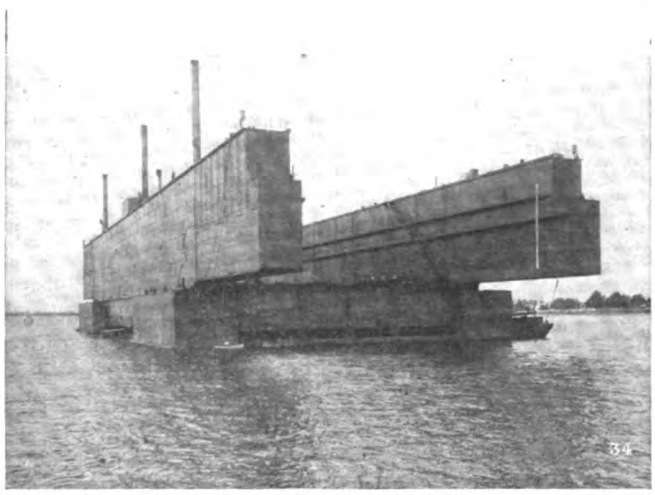
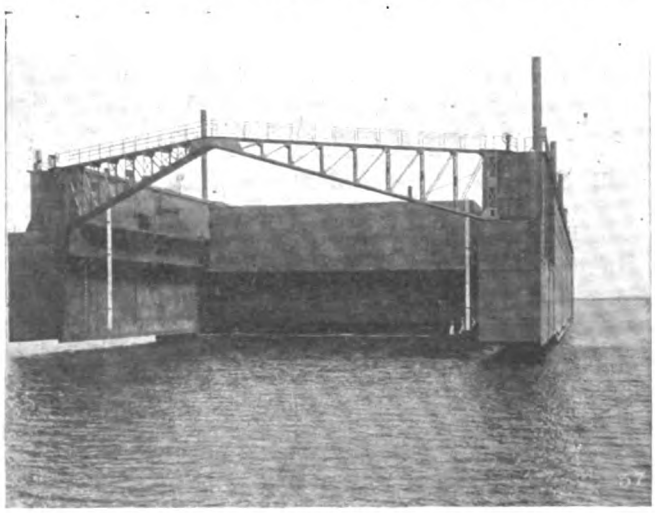
the machinery, the dock was declared ready for testing on June 17, 1905, just one month before the expiration of the contract time of twenty-seven months from date of award. On June 23, the cruiser Colorado was docked, followed by the battleship Iowa on June 27, and the preparations were at once begun for the self-docking trials.

The article by Mr. Cunningham appearing in this issue, fully describes the successful docking of the Colorado and the Iowa. This article, coming as it does from the officer who wrote the specifications under which the dock was constructed, and who was closely connected with its preliminary design, is of peculiar interest, but, as it covers only the ship-docking tests, it may not be out of place to add a brief account of the subsequent self-docking operations.



CENTER PONTOON SELF-DOCKED ON END PONTOONS.

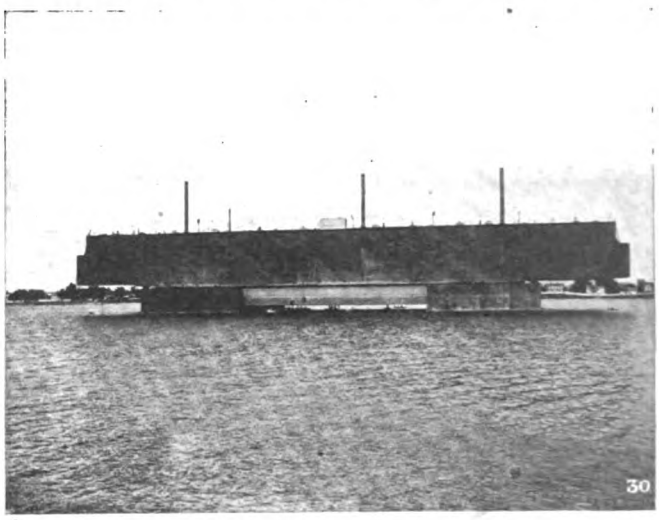
In regard to the desired self-docking qualities of the dock, the specifications provide that it "shall be so designed and arranged as to be readily self-docked without the aid of divers or auxiliary constructions;" that the working stress of any portion of the dock or its connections shall be limited to "15,000 lbs. per square inch in self-docking, with a wind pressure of 30 lbs. per square foot of exposed surface;" that "when self-docked all under-water portions shall be raised to a height of not less than 5 ft., and shall be safely and readily accessible for inspection, painting and repairs;" and, that with the dock at light-draught line, "all self-docking and strain-transmitting connections shall be above water."



END PONTOONS SELF-DOCKED ON CENTER PONTOON.

It may help to a clearer understanding of the operations to give, briefly, a general outline of the design in so far as it affects the self-docking features before attempting to describe the working tests. The dock is built in three sections. The center section, or pontoon, is 316 ft. in length, with side walls overhanging 80 ft. on either end. Two end pontoons, each 90 ft. in length, with low independent side walls, are attached to the center pontoon in such a way that the overhanging side walls of the latter are enclosed between the independent walls of the end pontoons and rest directly on their decks when the sections are connected for docking ships. There are vertical and horizontal connections between the pontoons, the vertical connections consisting of seven elements, each made up of forty-four 2-in. bolts; the horizontal, of four elements, one along each edge of the overhanging side walls, each made up of ninety-six 1½ in. bolts, The lower ends of the vertical connections are out of water at light draught.

The self-docking is accomplished in two stages. After removing the connection bolts, the end pontoons are hauled clear of the overhanging walls of the center pontoon, turned so that the direction of their length is perpendicular to the axis of the dock, and brought over the deck of the center pontoon and centered on blocking, as in the docking of ships. The center pontoon is then pumped to the desired freeboard by the main pumping engines. The second stage of the operations has for its object the lifting of the center pontoon. The end pontoons are submeregd to a depth giving 12 in. clearance between the blocks and the bottom of the center pontoon at light draught, and are then drawn under either end and centered, after which they are pumped to the desired freeboard by means of a separate pumping plant installed in the independent side walls, to which steam is furnished by a flexible hose led from the forward and after boilers.



CENTER PONTOON SELF-DOCKED ON END PONTOONS.

On Saturday, July 15, 1905, the work of arranging the blocks of the center pontoon for receiving the two ends was finished, and all vertical connection bolts, together with half of the horizontal bolts, were removed. On Monday, cables 1 and 2 (see accompanying sketch) were slipped from the end pontoon bitts, starboard side, forward, and made fast by hawsers to bitts on the top of the overhanging side walls. On Tuesday, cables 3 and 4, forward, were similarly slipped and belayed on the port side-wall bitts. All horizontal connections were removed and steel drift pins placed in the bolt holes at intervals of about 25 ft., with men standing by for each pin. At 12:15 p. m. the flood valves of the forward pontoon were opened, and ten minutes later the horizontal connection diaphragms came gently apart. With the aid of a small tug boat, the end pontoon was hauled clear of the overhanging side walls at 12:53 p. m., and made fast against the starboard side of the center pontoon at 1:35 p. m. Cables 2 and 3 were then slipped from the tower-deck bitts and

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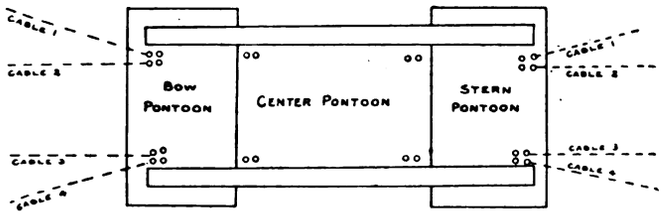
made fast to the forward-deck bitts of the center pontoon with two shots of chain which had previously been detached from cables 1 and 4. An anchor-hoy and tug was used in shifting moorings and handling cables.

On July 19, cables were slipped from the after pontoon bitts and made fast to the side-wall bitts as was done in the case of the bow pontoon. All horizontal connection bolts were removed and the flood valves opened at 10:20 a. m. The pontoon began to drift out with the tide at 10:49, and was hauled to the port side of the dock and made fast at 12 m. Cables 2 and 3 were then slipped from the tower bitts and made fast to the after center pontoon bitts as for the bow pontoons.



On July 20, the center pontoon was submerged to an average draught of 33 ft., giving a little over 12 in. clearance between the bottoms of end pontoon and the blocking for a draught of 9 ft. The end pontoons were then hauled in and centered over the keel blocks. Pumping was commenced at 12:26 p. m., the blocks were awash at 1:25, and the pumps were stopped at 1:40 with a freeboard of 18 in. the total time of pumping being 1 hour, 20 minutes. All mud valves in end pontoons were opened at 1:00 p. m., and the compartments drained with the falling water.

During the next three days the pontoons were held on the blocks and the time was spent in cleaning and repainting such parts of their bottoms as seemed to require it, and in arranging the blocking on the ends for seating the center pontoon. On July 24 the mud valves of the end pontoons were closed at 8:40 a. m., the flood valves were opened at 9:15 and closed with the pontoons afloat at 10:00 a. m. The pontoons were lashed together in tandem and drawn out with the tide, being clear of the dock at 11:31 a. m. Both were then made fast to the starboard side of the center pontoon. When floated, the end pontoons had an average draught of 450 ft., making their joint displacement 3,164 tons.

The 25th. of July was consumed in arranging the blocking. and on the 26th., the work of docking the center pontoon was begun. Cables 2 and 3 were slipped and led by hawsers to side-wall bitts, the dock being held in the meantime by cables 1 and 4. At 8.30 a. m. the stern pontoon was sunk to sufficient depth to permit its being hauled under the overhangs, and at 11:40 it was in position and ready for sinking to full draught. At 1:05 the flood valves were opened, and at 3:50 p. m. the pontoon had reached an average draught of thirty-one feet, the sinking being carried on very deliberately on account of the possible effect of the strong ebb tide, nearly always to be contended with at this point. After reaching this depth the pontoon was drawn under the center pontoon and centered over the blocks. The pumps were started and continued until the pontoon reached a draught of twenty-eight feet, and the center was firmly seated.

On July 27 the dock was simply held in position and observations made for possible settlement. On July 28 the bow pontoon was drawn into position, sunk to a draught of 31 ft., drawn under the center pontoon and, at 2:20 p. m., pumped to a uniform draught with the stern pontoon. Both end pontoons began pumping full speed at 2:20 p. m. and reached a freeboard of eighteen inches at 7 p. m. After holding the dock in this position for four days, the work of undocking was commenced, but, on account of bad weather, this work was discontinued and the end pontoons were held at 26 ft. draught until Aug. 2 when the stern pontoon was hauled from under the center and connected in its proper position. Two more days were lost on account of the weather, and the bow pontoon was withdrawn and connected on August 4. No difficulty was encountered in entering the connection bolts, and each pontoon was sunk, hauled out, pumped to proper draught and connected in twelve hours' time.

The total working time consumed in the self-docking tests exclusive of the time spent on the blocks, is about fifteen days, and, when it is taken into consideration that this work is absolutely new, that it was necessary to proceed with caution during the first test, and that the crew was naturally unused to its work, it would seem probable that the time for future self-dockings could easily be reduced to ten or eleven working days.

Numerous devices have been exploited in the past, all claiming more or less novel means to enable floating docks to lift their hulls for inspection and repairs. Few of these devices appear practical, and still fewer have been actually tried on large structures. The most prominent among the self-docking types is the Clark & Stanfield modification of the Rennie type, represented in this country by the naval docks at Algiers, La. and at Pensacola, Fla. The Algiers dock was successfully self-docked by her builders during the acceptance tests, and required for the operation about forty days. It succeeded in lifting the pontoons to a height of four feet and the side walls to a height of twenty-one inches above water. The Pensacola dock has docked her intermediate pontoons, but is only now, for the first time, attempting to lift the end sections. So far as I am aware, the new Bermuda dock has never been completely docked, nor has the new naval dock at Pola, Austria, the latter being an entirely new design.

The Cavite dock has, so far, proven a complete success, and the self-docking features are particularly satisfactory. In the light of experience with other self-docking types, it would seem that, as regards the saving effected in time and labor, facility of control and simplicity of operation, the self-docking problem has been satisfactorily solved and the greatest objection to the floating dock per se completely eliminated.

The self-docking tests were conducted by a board of which Capt. Adolph Marix was senior member, and Naval Constructor W. G. Du Bose and Civil Engineer Leonard M. Cox, members.

BIDS FOR NICKEL STEEL FORGINGS

Washington, Oct. 28.—The bureau of ordnance of the war department this week opened bids for one set of nickel steel forgings for the 3-inch rifle, model of 1902, the proposals received being as follows:

Crucible Steel Company of America.....40c per pound.
Bethlehem Steel Co.....40c per pound.
Midvale Steel Co.....40c per pound.

The Bethlehem and Midvale companies could neither of them promise delivery in less than seventy days, but the Crucible Steel Company offers delivery in 50 days. No award has as yet been made. The bureau of ordnance will, on November 7, open bids for thirty-six sets of 3-in. forgings, and for thirty-two 3-in. field guns.

The steam schooner Johan Polson was launched from the White Ship Yard, Everett, Wash., last week. She was 190 ft. long and will engage in the lumber trade between Portland and San Francisco.

The T. S. Marvel Ship Building Co., Newburg, N. J., has purchased a plot of 1,600 ft. off the Hudson river front for the purpose of enlarging its plant.

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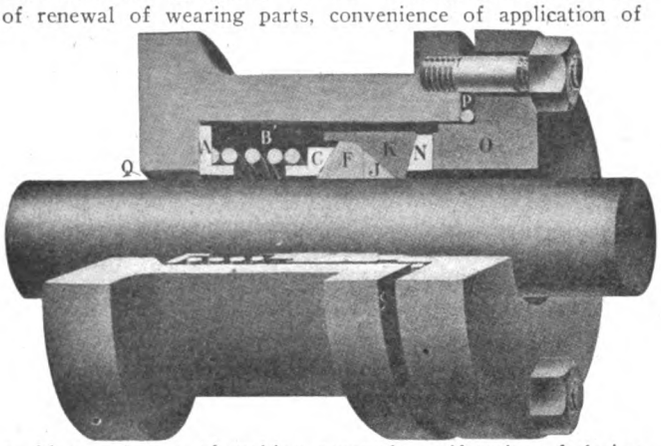
COOK'S METALLIC PACKING

Probably no other appurtenance of a steam engine is as much discussed among engineers as packing. In the past ten years it has become classified as metallic packing until now scarcely a large power plant is built without the engine contracts specifying some kind of metallic packing. The subject, therefore, reaches importance as the various features that go to make up a packing's working efficiency are considered. What may be held among them as principal are: simplicity, or least possible number of parts; each part embodying a prominent factor to the whole; each part, while subject in its service to the remaining parts, as little dependent upon the other parts as possible for its merit.

It seems that as this is the object to be sought in the device's mechanical make-up, the results it should work out are as follows: A minimum degree of friction on rods, a maximum lasting quality of the wearing parts, low cost of renewal of wearing parts, convenience of application of



packing and ease of making renewals, uniformity of design in varying kinds of service in order that conditions of all classes of packing may remain the same, and finally that the packing should in a high degree be automatic in its accommodation to the working and wearing conditions of the engine. A prominent feature thereof is the ill alignment of rods, so as to avoid the annoyance of adjustment. Cook's metallic packing, which we herewith describe, seems to approach these qualifications without exception.

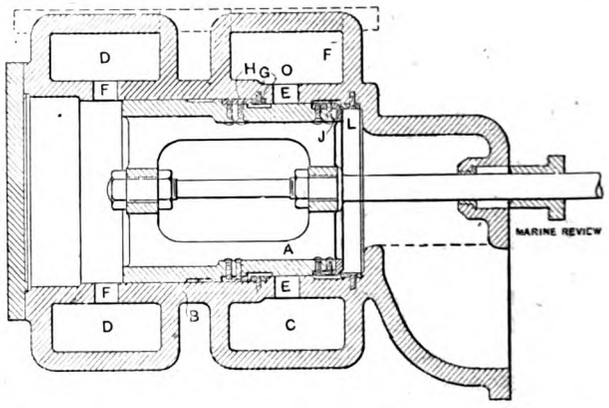
The packing consists of spring guide "A," which first enters stuffing-box of the engine, and holds spiral spring "B" in central position around rod. This spring presses against follower "C," which in turn compresses segmental babbitt rings "F" and "J" to the rod. These rings receive their compression to the rod by means of their outside surfaces, which are conical. The rings fit into a cone shaped cup, or casing, "K" having the same degree of taper as the rings. Thus it is seen that as the spring assisted by the steam pressure, forces the rings against the taper of the casing, the rings in turn are compressed to the rod. The segments of the babbitt ring overlap each other, which seals the openings where segments are cut, and on one of the segments there is a lug. This lug is arranged so as to hold the openings of the segments at right angles to each other, making a leak through them impossible. The follower "C," which compresses the rings into the casing, is also tapered, to which a corresponding taper on the back of ring "F" is fitted. This results in a double cone packing. On the front end of the described casing "K," ball ring "N" is attached with a ground joint, the opposite side of which is flat, and is ground to the gland "O." This arrangement is to allow the packing to follow any vibratory action of the rod, and still retain a steam-tight joint. The gland "O" to which the packing is fitted and which forms a part of the packing, is equipped with copper wire gasket "P," making a joint between gland "O" and cylinder head, when gland is bolted home.

Over ten years of experience has demonstrated that this packing will enter into any kind of steam service, from low pressure under high vacuum, to high pressure above 250 lbs., super-heated 150 degrees, without changing the design of a single part of the packing.

This type of packing is extensively in use on both piston rods and Corliss valve stems of the Carnegie Steel Co., the New York subway, and for marine work, the double type packing, which comprises two distinct sets, exactly alike, bolted together, and which is used in the United States navy, is especially recommended. The packing is made by the C. Lee Cook Mfg. Co., Louisville, Ky., and their new catalog, just out, which describes and illustrates fully all the features of the packing, will be gladly sent to any address upon request.

PISTON VALVE FOR REVERSING STEAM TURBINES

The accompanying illustration shows a piston valve recently invented by the Hon. C. Parsons for use in connection with the application of steam turbines to marine propulsion. In this work difficulty has sometimes occurred with the piston valve which regulated the steam supply to the turbines used for driving the vessels ahead or astern. The usual construction of the valve is either with an accurately machined mechanical fit or with split rings to prevent leakage. Leakage is decidedly objectionable with a turbine as when going forward the leakage allows live steam to pass from the "go ahead" turbine to the "go astern" turbine, thus causing considerable loss of power as well as destroying the vacuum in which the latter nominally runs. If the valve is made with such a nice fit as to prevent this leakage there is danger of its jamming, and when rings are used the friction of the rings under steam pressure causes serious resistance to the operation of the valve. Mr. Parsons has designed the present valve to prevent this leakage, without using packing rings or being under the necessity of accurately fitting the piston in the valve chamber.



The piston valves as usually constructed consist of a cylindrical casing with two rows of ports near each end. Within this casing a cylindrical shell is introduced of such length that when it is pushed from one end to the other it alternately covers or uncovers the ports. After live steam is admitted to the center of the shell, that steam will be permitted to pass into either one of the ports and delivered to the turbines used for driving the vessels ahead or astern, according to the position of the shell.

The improvement in the valve consists in providing a piston valve which has faces which are adapted to close against seatings fixed to the valve casing when the valve is at its extreme position. Leakage is thus prevented when the valve is at either end of the chamber and the necessity of rings or accurate fitting of the piston is avoided.

The illustration is a section through the valve, the valve being in its open or "go ahead" position. The piston valve

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is denoted by A. This valve reciprocates in a cylindrical casing B. Surrounding the casing are two chambers C and D which communicate with its interior by means of ports E and F respectively. The valve chamber B is in two parts, of different diameters. The step from the larger to the smaller diameter being between the ports E and F. At this point there is a valve seating G. A shoe in the valve, which is denoted by H fits closely against this seating when the valve is full opened to "go ahead" position. The chamber D is connected to the turbines for driving a vessel ahead, and the chamber C to that driving them astern. At the front end of the valve is a shoe J which bears against the seating L when the valve is open. The position of the valve can be altered by operating the piston rod projecting through the stuffing box as shown.

In the position of the valve as shown the two conical valve faces H and J completely shut off the chamber F communicating with the reversing turbines. No live steam can pass into this turbine and effect the vacuum in which it works.

EUREKA PACKING

In the multiplicity of rod packings on the market at the present time, with new ones being brought out almost every week, it must be a puzzling matter to the engineer to determine which is best suited to his needs and these needs seem many, because there are so many conditions existing, such as worn and fluted rods, rods out of line, shallow stuffing-boxes, extreme heat, etc., that the kind which may do fair service in one engine, pump or other machine, may seem of little value in another. It would seem, therefore, that a special kind of packing must be used for each condition, but the writer thinks it a very erroneous idea. The all important feature in packing, is its ability to make a tight joint around a moving rod where the rod is uneven, cut or out of line, without creating undue friction, because friction means waste energy, consumption of steam and naturally loss in power and fuel and should be carefully avoided. That loss may seem trifling but in a season's run must necessarily represent a considerable amount, which adds just that much to power expense. That is not all. Friction means wear of rods, which in time need either renewing or turning down at a considerable expense and loss in time.

Accordingly, if we acknowledge that a perfect packing must be as near frictionless as possible, it is but natural to consider the right material and principles necessary in the construction of same. Experience proves that the best wearing material is long fiber flax well lubricated with high test lubricants. The expansive, elastic feature must be secured by the use of a good quality of rubber. Consequently if flax in the form of twisted cords is braided around a rectangular strip of rubber, the desired elastic "give and take" effect is secured, which is so necessary where a rod is worn, scored or out of line and equally effective on a true rod. In this construction, the rubber cannot come in contact with the rod. If this argument is sound, it seems strange that manufacturers of packing generally have lost sight of this most important feature—elasticity; much ingenuity has been shown in getting up many attractive kinds (to the eye) but the one necessary requisite—adaptability to all conditions of the rod —has been lost sight of.

It may be argued that flax or any vegetable fibrous material is not adapted to the high temperature where high steam pressure is carried, but here again a little ingenuity can be used in placing in the bottom of the stuffing-box, a turn of a well lubricated asbestos packing which will take the severe effect of the extreme heat, while on top of this turn of asbestos, the elastic flax can be placed and give most excellent results.

The arguments advanced in the foregoing remarks took practical form some years ago by a long-headed, thinking marine engineer. Having much trouble with the packing he was using, it occurred to him that a braided flax with a rubber core would be of service and he cut up one of his foot valves, braided flax around it by hand and the result was so satisfactory he ever afterwards used it as his standard. Unlike others, he did not keep this good thing to himself but told his friends, some of whom started to make packing by machinery and called it "Eureka." It was a success from the start and has continued successful ever since and now is known the world over as the packing that adapts itself to any rod conditions without creating friction. This packing is manufactured by James L. Robertson & Son, 204 Fulton street, New York.

FLEXIBLE METALLIC PACKING

In these days of high speed engines and of consequent high steam pressure, the question of the packing for the rods and valve stems requires more consideration than ever before. To find a packing which will withstand the required pressure, which will not become hardened by the extreme heat, which will be as near anti-friction as is possible, thereby saving the wear on the rod, as well as saving power, should be the aim and object of every engineer.

All engineers agree that such a packing must be made of metal. The next proposition which confronts the engineer is the question of expense, or cost of such a packing. The Clark's flexible metallic packing, manufactured by the Clark Flexible Metallic Packing Co., 130 Oliver street, Boston, Mass., fulfills all the requirements stated above. It is made of a metal fiber, the alloy of which is as near anti-friction as possible. It is then formed into rings and covered with a very thin cover of rubber, which is then vulcanized, which binds the fibers together and makes it easy to handle; it also prevents the metal fibers from becoming a solid mass in the stuffing-box, and it can be blown out the same as any soft packing.

By the friction of the rod a thin scale is formed on the inner surface of the ring, making it, where it comes on the rod, practically a solid metallic packing; but back of that scale the fibers are all separate, ready to be brought down on the rod by the pressure of the gland, when the fibers underneath or next to the rod shall have worn away, and when the gland cannot be screwed up any further it is not necessary to take the packing all out and throw it away, but it is necessary only to add another ring, and the packing is as good as when first installed.

You have here a packing which will not cut, score or wear your rod, which will withstand any pressure of steam (not super-heated); will withstand a temperature of 600 degrees F.; which is as easy of installation as any so-called soft packing, and which does not become hardened like soft packing (made of asbestos or vegetable fibers and rubber) by heat, after which they act on the rod like a file or a fine piece of emery, according to the quality of the packing, and no matter how well you keep them lubricated you are constantly wearing out your rod, if you are not scoring it, which is more probable.

You have also the lasting qualities of a metal packing, at a less first cost than for any solid metallic packing, with a very small renewal cost, at the end of two or three years, whereas with the solid metallic packing you must install a full set.

This packing stands approved by the United States navy department, where metallic packing is called for in the construction of battleships.

The company claims that results obtained by the use of Clark's flexible metallic packing are just what the engineer of today is looking for, and the cost just what the purchasing agent is looking for, and its use will assist in producing the dividends which the stockholders are looking for.

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FREIGHT SITUATION

The lake shipping season is now within five weeks of its close with everything pretty well in hand. One of the leading vessel owners reports having obtained a wild rate of $1 from the head of the lakes to Lake Erie ports, but none of the leading shippers are paying this. The ore movement is sufficiently well covered by contract so that little wild chartering is being done. Of course, if there was considerable wild ore to be moved by the leading shippers, it would probably be at an advance over the contract rate, owing to the disparity which now exists between the wild ore rate and the grain rate. The movement of freight is now being attended with the usual difficulties inseparable from fall months. Ore is beginning to freeze in the pockets and vessels are being delayed both loading and unloading. There is also considerable congestion at Buffalo in the grain fleet. The coal rate to Lake Michigan ports has undergone a decided advance, fifty-five cents being paid on soft coal and sixty cents on hard coal. The contract movement has, however, taken care of the majority of the smaller ports on Lake Michigan. As far as is known, there is no change in the rate to the head of the lakes.

TWO MORE STEAMER ORDERS

During the week the American Ship Building Co. has closed contracts for two more freighters of the largest dimensions. Both contracts were placed by the Hawgoods, the first by W. A. and A. H. Hawgood, for a freighter to be 545 ft. over all, 525 ft. keel, 55 ft. beam and 31 ft. deep, to be equipped with triple expansion engines, 23½, 38 and 63 in. cylinder diameters by 42-in. stroke, supplied with steam from two Scotch boilers 14 ft. 6 in., by 11 ft. 6 in., allowed 180 lb. pressure. The second order was placed by Henry A. Hawgood and his son, H. B. Hawgood, for a steamer to be a duplicate in general dimensions of the James C. Wallace. The new steamer will therefore be 552 ft. over all, 532 ft. keel, 56 ft. beam and 31 ft. deep. She will differ from the Wallace in that her engines will be triple instead of quadruple expansion. This makes twenty orders that the American Ship Building Co. has received for 1906 delivery. One of these steamers, the John Stanton, has already been delivered and it is expected that another, the Joseph G. Butler, Jr., will be delivered on Dec. 1. The Butler will be launched on Saturday next at the Lorain yard.

GREAT LAKES ENGINEERING WORKS

The annual meeting of the Great Lakes Engineering Works was held on Tuesday of this week at Detroit. The financial statement submitted shows the company to be in excellent condition. During the year the company constructed and delivered eight steel vessels and has under contract at present six steel freighters. The following directors were elected: H. C. Potter Jr., Joseph Boyer, George H. Russel, Henry Ledyard, R. E. Plumb, Antonio C. Pessano and John R. Russel of Detroit; H. W. Hoyt of Chicago; O. P. Letchworth, Buffalo. Officers were elected as follows: Antonio C. Pessano, president and general manager; George H. Russel, vice president; John R. Russel, secretary and treasurer.

The Babcock & Wilcox Co. has installed the boilers on the battleships Louisiana and Minnesota and the cruisers West Virginia, Maryland and Charleston. It has the contract for furnishing boilers for the armored cruisers North Carolina and Montana.

CHICAGO GRAIN REPORT

Chicago, Oct. 31.—Shipping of last week via lake in the aggregate but slightly in excess of one million bushels—thus establishing the lightest weekly record for the 1905 season. The going lake rate situation has practically no bearing in the volume of hauling. Prices have been easily maintained @ 2¼c corn and 2½c to 2¾c wheat with good tendency to 3c wheat ere the close of present week, and Kingston and Ogdensburg nominally 4c to 4¼c corn and @ 6c through to Montreal.

The movement, immediate and prospective, turns almost entirely with the dispatching situation of Eastern terminals for it will again be noted that for the same period grain handling out of Chicago via railroads is in excess of lake some upward of 1,000,000 bu. The cash grain market is in excellent shape as evidenced by the prosperous state of carrying charges both inland and ocean, and it rests with the interests in control of the handling terminals to facilitate the situation. On the going basis of 13c per 100 lb. to New York, with prompt excess to the seaboard, railroads are competing for business out of Chicago and vicinity at about even prices with lake offerings.

Shipments of the past week distributed about as follows: Via all rail lines of flour 88,534 bbls.; wheat 88,758 bu.; corn 654,600 bu.; and oats 1,471,227 bu. Via lake to Buffalo and other American ports of flour 134,000 bbls.; wheat 103,000 bu. and corn 501,000 bu. and via lake to Canada points of flour 285 bbls.; corn 153,000 bu. and oats 104,050 bu.

Lake and rail shipments.

	This week.	Last week.	Same week last year.
Wheat	191,818	261,224	433,989
Corn	1,308,676	1,901,833	1,105,462
Oats	1,575,277	1,580,525	1,211,775
Rye	17,935	33,850	48,182
Barley	353,362	364,914	301,518
Total	3,447,068	4,442,346	3,100,926
Flour	222,445	203,907	119,378
	Since Jan. 1, 1905.		Same time last year.
Wheat	10,895,400		13,729,267
Corn	80,780,078		63,293,881
Oats	49,517,718		39,539,669
Rye	958,034		1,085,720
Barley	4,228,399		4,125,692
Total	146,379,629		121,774,229
Flour	5,735,335 (Bbls.)		6,066,980

Stocks of grain in elevators.

	This week.	Last week.	Same week last year.
Wheat	6,450,000	6,604,000	4,510,000
Corn	1,046,000	1,825,000	1,755,000
Oats	13,034,000	12,712,000	9,805,000
Rye	351,000	351,000	701,000
Barley	329,000	150,714	233,000
Total	21,210,000	21,642,714	17,004,000

Capt. George Stone, eighty-two years old, and for sixty years one of the best known captains on the great lakes, died at his home, No. 4211 Euclid avenue, Cleveland, last week. Capt. Stone may be said to have been identified with lake commerce ever since it became a commercial pursuit on the lakes. At any rate, that statement is absolutely true in so far as Lake Superior is concerned.

The annual report of the Pacific Mail Steamship Co. shows gross earnings of $5,775,783 for the fiscal year just closed. The total expenses were $4,480,711, leaving a balance of $1,295,012. There was given $496,000 for depreciation and repairs; $371,000 for the lease of new piers, leaving a surplus amounting to $427,656. The company's list includes sixteen steamships.

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SPECIAL PURCHASING AGENCY

Washington, Oct. 28.— Prominent officials in the purchasing department of the war and navy departments state to the *Review* correspondent that in their opinion there is not the least likelihood that any change will be made in the present system of awarding machinery and equipment contracts, orders for new warships, etc., even should Congress authorize a special purchasing agency to award contracts for all departments of the government as advocated by the Keep Commission, which is endeavoring to infuse system and economy into governmental business administration.

It is conceded that something in the way of a general purchasing agency will be established, but officials of the war and navy departments aver that in so far as these two branches of the government are concerned, the new institution will deal only with such commodities as paper, ink and other like supplies, and will not touch such items as machine tools, etc., which are not shipped to Washington or any other distributing point, but are sent direct from the manufactory to their ultimate destination.

Indeed it is freely declared in the two departments that no general purchasing agent, however capable would possess the technical knowledge essential to enable him to intelligently and advantageously place contracts for army and navy equipment and supplies, and certain it is that the clerical force necessary were these contracts as well as the others mentioned, to be handled at a common center would inevitably be so large as to make the centralized purchasing department a decidedly unwieldy institution, with consequent delays in openings of bids, awards of contracts, etc.

SALVING THE ALAMEDA

Editor *Marine Review:* Your letter, addressed to Capt. A. F. Pillsbury, has been handed to me and I beg to advise you that Capt. Pillsbury is our salaried surveyor and in pursuit of his duties, took charge of the Alameda case, immediately after the vessel stranded, in conjunction with Capt. John Metcalfe, surveyor for Lloyds Register, representing the English underwriters. These gentlemen immediately laid their plans for floating the vessel. The vessel was stranded on a rocky point, just on the inside of the Golden Gate, close to shore and the floating her involved nothing out of the ordinary way, provided the weather should hold good. Arrangements were immediately made to discharge the cargo and install a number of pumps.

On the afternoon of the sixth day three 12 in. centrifugals, one 10 in. and five 8 in. plunger pumps and one 6 in. centrifugal were in place, the principal hole under the boilers had been stopped, and with the assistance of three tugs, the vessel came off at high water.

We are not well equipped for prompt salvage operations at this port and the surveyors in charge deserve great credit for the promptness with which the miscellaneous assortment of pumps and gear was got together and put in working order. The vessel was subsequently docked and found to have sustained damage to the hull, which will be repaired by the Union Iron Works Co., under contract, at a cost of $30,000.

The largest hole was fortunately in the small portion of the vessel connected with the oil tanks, which served as a double bottom. In addition to the cost of repairs, stated above, the overhauling of the engines and re-equipping the vessel would cost probably another $25,000 or $30,000, and the salvage operations would amount to about $25,000.

The weather fortunately remained unusually fine, although there was swell enough to move the vessel on the rocks on the fourth day. Had she remained on a couple of days longer the vessel would probably have been more seriously damaged.

EDW. L. WOOD.
Secretary Board Marine Underwriters.
San Francisco, Oct. 20.

EXPOSITION SHIP EXCURSION

The Exposition Ship Co., Suite 508, Bradbury Bldg., Los Angeles, has chartered the ship Spokane for a trade excursion from San Pedro, Cal., to Panama. Along the west coast of Mexico and the Central American republics there are many populous and prosperous cities. An enormous amount of trade is carried on between the people of those cities and England and Germany, while a comparatively small amount comes from the United States. It is presumed that a portion of this trade at least can be brought to the United States if the proper concerted effort is made. The Exposition Ship Co. was projected for the purpose of providing a practical and inexpensive method of determining what the probable extent of this trade will be, and of affording manufacturers and exporters an opportunity of visiting the principal ports of the countries on the west coast as far south as Panama, and coming in personal contact with the business men of these countries. The exposition ship will start on Jan. 10.

WASTAGE OF LAKE VESSELS

The recent storm on the great lakes subtracted a number of vessels from the bulk freight trade, but the tonnage, that is to say, the carrying capacity that is eliminated is inconsiderable. It would be amply covered by any three of the twenty-five ships that are now under order for next season's delivery. Through accidents and collisions the following vessels were removed from the active list earlier in the season: The Etruria of 6,250 tons, Hesper of 3,000, Thomas W. Palmer of 3,100 tons, Yakima of 3,000, Linden of 1,450, George V. Presley of 2,800, John M. Hutchinson of 1,900 tons; total 21,500 tons.

The wastage due to the elements in September and October were as follows: Sevona, 4,500 tons; Iosco, 3,000; Olive Jeanette, 2,443; Pretoria, 5,100; Sara E. Sheldon, 950; Tasmania, 1,700; Yukon, 3,261; Kaliyuga, 2,690; Mautenee, 1,200; Minnedosa, 2,000; Joseph S. Fay, 1,490; D. P. Rhodes, 1,600; Alta, 1,650; Oregon, 1,250; Siberia, 2,200; total, 33,834 tons; making the grand total for the year 55,334 tons. Practically five ships of those building will replace this wastage.

BIDS FOR DREDGING GRAY'S HARBOR

Washington, Oct. 28.—Bids have just been opened by the government engineers for the work of dredging Gray's Harbor, Wash. The bidders were the Puget Sound Bridge & Dredging Co. which submitted an estimate of $0.2974 per cubic yard and the International Contract Co., which proposes to do the work for $0.2909 per cubic yard. The entire contract will amount to about $25,000.

All hope to get the ill-fated steamer St. Paul off the rocks at Point Gorda has been practically abandoned. Everything movable has been taken from the left by the wrecker Greenwood.

The American Ship Windlass Co., Providence, R. I., has equipped the boiler room of the Narragansett Brewing Co. with an underfeed stoker. A test shows an increase of 13 percent in evaporation of weight as compared with hand firing.

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THE HAYDEN METALLIC PACKING

The Hayden metallic packing is designed to provide all the essentials found necessary in a successful packing, such as: the proper designs for any pressure or vacuum; the very best of workmanship; the proper materials to insure durability; the design is such that friction and wear are reduced to a minimum; perfect joint is made on rod; provision is made for vibration of rod; provision is made for oscillation of rod; provision is made for out of line movement of rod; not affected by high temperatures; perfectly reliable under high speeds; especially designed to meet high

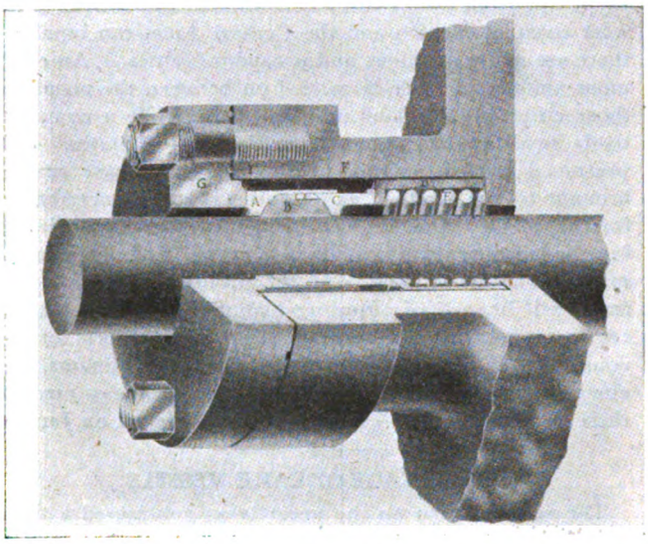

FIG. 2. A.—VIBRATING CUP. B.B—SEGMENTAL PACKING RING. C.—FOLLOWER. D.—STOP RING. E.—SPRING. F.—STUFFING BOX. G.—GLAND. I.—JOINT.

pressure and heavy duty. Owing to the parts being built exceptionally heavy to meet extreme conditions, and the novel and peculiar design of the segmental ring to overcome the objectionable features found in ordinary metallic packings, the company claims the following advantages: The packing is composed of few parts—only enough to provide for every condition of service. Any engineer or mechanic of ordinary judgment can apply the packing, and after first application the parts are permanent fixtures; no disconnecting of rod is necessary for the renewal of the packing ring. The ball joint surfaces on packing ring, the sliding joint between cup and gland and the clearance of cup in bore of box or gland, provide for all irregularities of

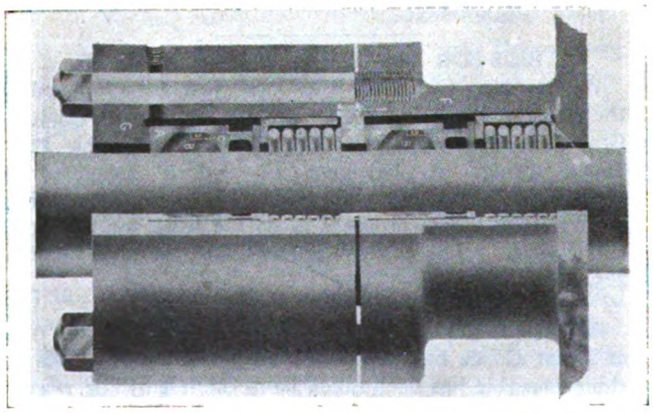

FIG. 1. A.A.—VIBRATING CUPS. B.B. B.B.—SEGMENTAL PACKING RINGS. C.C.—FOLLOWERS. D.D.—STOP RINGS., E.E.—SPRINGS. F.—STUFFING BOX. G.—GLAND. I.—JOINT. W.—WALL RING.

movement of rod in box, due to loose crossheads, pistons or other causes. Owing to the construction of the segmental packing ring, it cannot be unduly forced on to the rod by the pressure and friction and wear are thus reduced to a minimum. As wear of rod is so slight, no truing up of rods is necessary for a number of years. The only renewal necessary is the packing ring, which is the only part in contact with the rod. Rod is not worn oval or tapered, and after years of service, the renewal of packing ring will pack the old rod as effectively as the first application. Adaptability: The Hayden metallic packing can be applied to any stuffing-box that may have been designed for soft packing, or any other metallic packing without change to stuffing-box.

The company represents that it has had packing run for years without the slightest repairs, on engines running almost continuously, and the stopping of an engine and the consequent loss of time to repair the Hayden packing is a thing unknown.

The Segmental Packing Ring is made of composition metal, and is an alloy which will withstand the extremely high temperatures, such as are now common, without melting or breaking. The ring is made up of three segments, and is held between the vibrating cup and follower by contact on the ball joint surfaces; these surfaces are at such an angle to the rod, that the compression of the spring and pressure, are such as to allow a gentle bearing on rod, and no excessive wedging on the rod can take place. The angles on ends of segments are such that

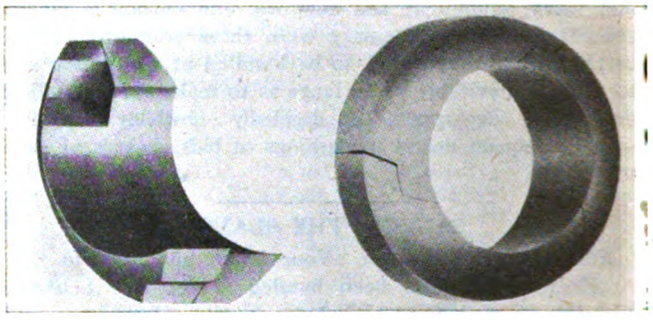

FIG. 3. SEGMENTAL RING INTERIOR VIEW. SEGMENTAL RING ASSEMBLED END VIEW.

the ring feeds to the rod slowly, taking up the slight wear of the ring, and friction is thus reduced to a minimum. As segments come together at ends and form practically a solid ring, the ring does not squeeze out between the vibrating cup and rod, nor score or wear the rod out of true; neither vibration, oscillation, or out of line movement of the rod puts any undue strain on the packing, and the packing is free to travel with rod and keep in perfect contact with it. As a result, friction is reduced to a minimum.

Fig. No. 1 illustrates the Hayden metallic packing, single type, and is especially suitable for horizontal piston rods and valve stems of steam engines, pumps, compressors, etc.

Fig. No. 2 illustrates the Hayden metallic packing, double type. This type of packing consists of two distinct sets of packing, separated by a wall ring, and is used particularly on vertical rods. On vertical rods with single packing, there is more or less condensation dragged out along the rod, as the stuffing box acts as a pocket to catch condensation from the cylinder. The second or lower set of packing catches this condensation, and is drawn off by means of a connection shown at bottom of gland. The second set of packing also is an additional precaution in case the first wears out.

The connection at bottom of gland is also used as a lubricator connection and the space between the two sets of rings can be partially filled with oil with a pump, and the rod travels in a bath of oil, making this a perfect method of lubrication. Fig. No. 3 illustrates the segmental ring.

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CHANGES IN LAKE CONDITIONS

Buffalo, Oct. 31.—Well, it has come, the late fall season, and with it the boom in certain rates of freights that will at least save certain parts of the fleet from the low earning or the loss that they had been facing so far. The word "certain" parts of the fleet suggests the mournful fact that it is not so large as it was a short time ago, the October hurricane, or a good imitation of one, again proving that it is useless to send out the old wooden vessels to battle against such weather. With two such terrible storms on the fall calendar it seems as though the rest of the season, only five weeks of it all, ought to be calm, and I am going to set up as a prophet and declare that the average of bad weather has been dealt out to us already, and the lakes are to be quiet now till they close with ice. Let us see how it will come out.

It looks as though the old good profits, more uniform and fat than in almost any other business, were things of the past. The big fleet has done this mainly by cutting down the ore rates, so that the day of easy syndication of a new fleet with money at 5 percent is gone, probably forever. I recall the easy enthusiasm of a lake man, and it was less than ten years ago, I think, with which he assured me that he could get all the money he wanted at such a rate, and he was working on that line. Well, he spoke within bounds then, but the day of such things was short, and he was driven out of the business before the fleet he saw in his mind's eye was set up.

Has the world ever conjectured a shiftier country than ours, one in which values run from one thing to another so fast, and yet a country that stands right side up so easily when there are so many people going to pieces from sticking to the old enterprise too long after the new one was crowding it off the platform? They were talking of a vessel owner the other day as especially lucky—as he had a way of being for the most part of late—in the way he got out of a steel steamer he had built within the past few years. When she was launched she was one of a class of steamers that was considered in the lead of most of the lake fleet in her ability to do almost anything and make money at them all. Well, the all-round lake craft is a thing of the past too, much more than used to be the case. The owner in question may have seen the fact in time, or he may merely have been lucky, for he sold his steamer for $175,000. She would hardly sell for $100,000 now. Gone out of date is the word. Will the new 500-footer and longer go just as fast?

Of course it is the wish to see certain of the smaller lake craft make some money that has prompted me to ask Old Neptune to stop stirring up things afloat for the rest of the fall. If he will do it there will be quite a showing made yet, for it is expected that the $4 lumber rate from Lake Superior will go to $5 before the season closes and if Lake Michigan wakes up to the down-freight business there will be plenty of doings that way yet. As it is the fleet has made a rush for Lake Superior. More than half the coal from here went straight to Duluth last week, as there is now a neat down rate on wheat.

The rate on coal to Fort William, which has been at 35 cents all summer and nothing doing for three months, went to 50 cents last week, and other ports will have to follow if they want more coal. The lumber fleet will all go up light rather than wait for coal at present figures. It is too bad that the car situation is crippling the coal movement. There are neither cars to bring the coal here nor to relieve the upper-lake docks, so that the shippers are handicapped. The shipment last week was the lightest of the season. As there seems to be no improvement in the car situation this fall the coal movement must be light, falling below that of last fall.

Perhaps it would not be possible to say anything new about the car famine but it is a relief sometimes to kick against the inevitable. One thing does seem to have been accomplished. The roads are trying to make the most of their equipment, and will usually let a car go anywhere to help a shipper out. It seems to have been developed in the late meeting at Chicago that the per diem charge for cars is too low to meet the requirements, and that it must be raised considerably yet before roads with insufficient car equipment will go to building them. Road managers with a good equipment made a fight for a 35-cent charge, but they were solidly opposed by such sections as New England, and the rate was advanced only 5 cents, so the big lines will still suffer from their cars being used as storehouses at 25 cents a day.

The grain fleet is lying here all the way up to ten days for an elevator, and there is much complaint, of course, but it is out of the question to study up any form of relief. New York is in a panic because the grain goes to other ocean ports from here, but we are perfectly willing to let that port sweat awhile. We are handling the grain in at least a fair rate, the roads shipped out 2,500,000 bushels last week, and the canal 785,000 bushels. JOHN CHAMBERLIN.

RECORD BREAKING ORDERS FOR EQUIPMENT

In its issue of Oct. 13, *The Railroad Age*, recorded orders for 460 passenger cars, 30,620 freight cars and 333 locomotives, and inquiries for additional equipment amounting to eighty-three passenger cars, 17,060 freight cars and thirty-five locomotives. The contracts reported this week are even more surprising in many ways, and when taken in connection with the large orders expected from the New York Central, Northern Pacific and other roads show that the high records for 1901 and 1902 for freight equipment and locomotives will easily be surpassed before the close of 1905, although the volume of orders in those years was exceptional, and notwithstanding the present high prices and the difficulty in securing prompt deliveries.

The orders placed by the Pennsylvania this week for 21,500 cars, in addition to the 16,160 ordered in August, made a new record in contracts placed by a single company, and practically preempts all steel car building facilities during the entire year of 1906. It is stated that all car manufacturers are crowded with orders and that the American Car & Foundry Co. alone have unfilled contracts aggregating over 60,000 cars, while no company can promise delivery before the middle of next year unless the order is for a few wooden cars. The greater number of the cars ordered during the current year are yet to be built and will keep the car manufacturers busy until well into the second half of next year.

From the detailed records kept by the Railway Age since 1901 of orders placed for new equipment the following totals are taken, the figures for 1905 covering the forty-one weeks up to the present:

	1901	1902	1903	1904	41 Weeks 1905
Freight cars....	193,439	195,248	108,936	136,561	196,672
Passenger cars..	2,879	3,459	2,310	2,213	2,297
Locomotives ...	4,340	4,665	3,283	2,538	4,131

It will be noted from the above table that orders for freight cars for the first forty-one weeks of the current year are in excess of any previous year, while the contracts for passenger cars and locomotives, if continued at their present rate, will also exceed any previous record.

The owners of the German turbine cruiser Lubeck and those of the Hamburg fitted with reciprocating engines have resulted in showing that the turbine steamer is no faster but burns three tons of coal less in every twenty-four hours.

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SOLID PACKINGS VS. SELF SETTING PACKINGS

Although it is generally understood that self-setting packings, or packings that are automatically adjusted by steam pressure or pressure from the gland, or both, have longer life and less friction than the best solid packings, the results of a series of scientific tests by the Quaker City Rubber Co., 409 Market St., Philadelphia, Pa., to ascertain exactly their relative merits brought forth some new and conclusive facts in favor of the self-setting packing.

With solid packings leaking is prevented by the packing swelling from moisture or heat or by the screwing up of the gland to compress the packing to the rod, or both. Either method produces a fixed pressure and unnecessary friction that shortens the life of the packing.

That one may more fully grasp the principle of the self-setting packing we will use as an illustration—Daniel's P. P. P. Packing—which is the original self-setting packing and commonly supposed to be the most efficient in its class. In mechanical construction this packing consists of two triangular shaped wedges backed by a yielding cushion.

The pressure of this packing on the rod is secured by means of the steam pressure on the packing, or pressure from the gland, or both, forcing the cushion and wedge to the rod, the wedge being free to work backward and forward with the varying pressure on the cylinder.

The packing is placed in the stuffing box loosely, the gland set up to it gently, and secured by the gland bolts and nuts; then as the steam or other fluid strikes the cushion the packing adjusts itself to the rod with a degree of tightness barely sufficient to prevent leaking and in proportion to the varying pressure on the packing.

The packing operates only on that stroke of an engine when there is any pressure on the stuffing box end of the cylinder; as no pressure at all is supplied by the gland on the return stroke of the rod, when the steam is on the reverse side of the piston there is nothing to press the wedges up and against the rod. In a word the self-setting packing only works on part of the one stroke of an engine and rests on the return stroke. Thus one can readily see where the self-setting packing prevents unnecessary friction and saves itself and the rod from wear and tear.

The scientific tests mentioned above proved that the solid packings, or those not self-setting, increased the friction on the rods so that it required from 2.31 to 7.27 more horse power to maintain the same piston travel, while the increased friction on the rod of the solid packings ranged from 11.62 per cent to 59 per cent.

The money value of power saved by the use of the self-setting packing, as shown by these tests, ranged from $104.96 to $250.00 a year per rod, while the solid packings exceeded the self-setting packings in cost from 80 to 240 per cent.

The United State steamers Glacius, Brutus and Caesar which are to tow the drydock Dewey from Baltimore to Manila will each be supplied with one of the largest size Shaw & Spiegle patent automatic steam towing machines manufactured by the American Ship Windlass Co.

The new steamboat Virginia for the Old Bay Line of Baltimore has left the yard of her builders, the Harlan & Hollingsworth Co., Wilmington, Del. Contract for the construction of the Virginia was signed Dec. 21, 1904, keel was laid Feb. 17, 1905, and she was to have been completed Nov. 21 this year, but was finished ahead of time. The Virginia is 306 ft. over all and 55 ft. beam over guards.

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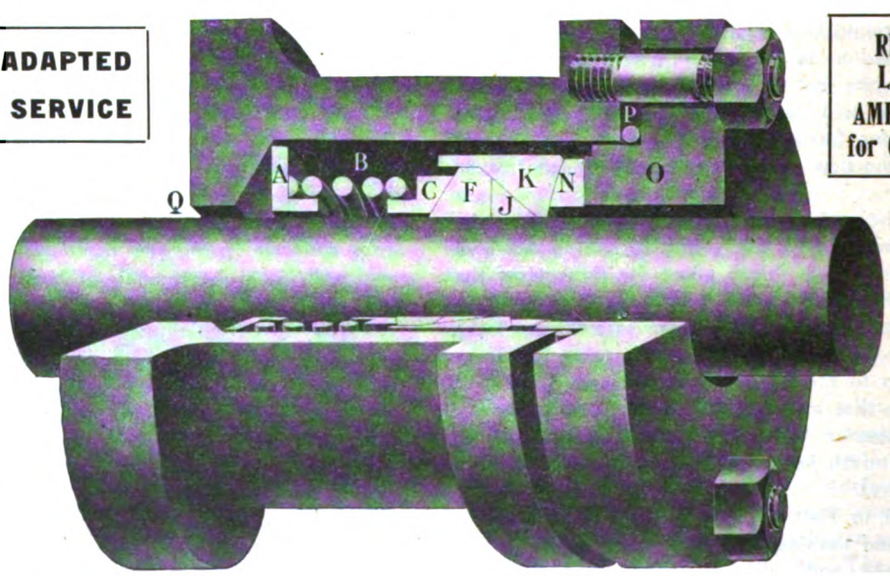
ESPECIALLY ADAPTED TO MARINE SERVICE



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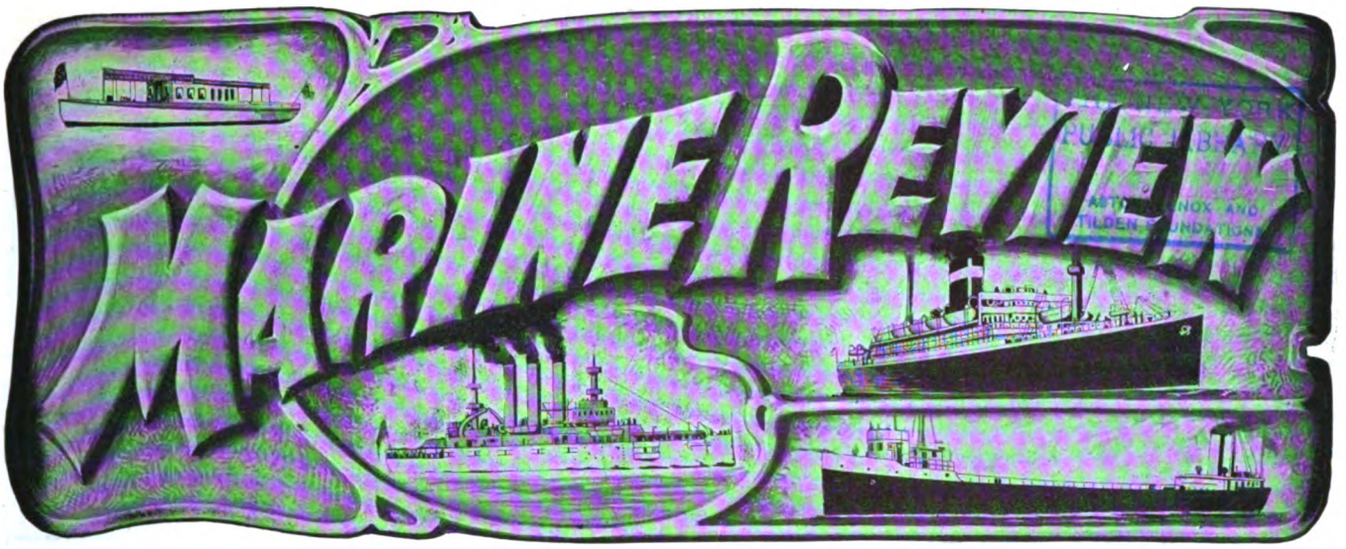

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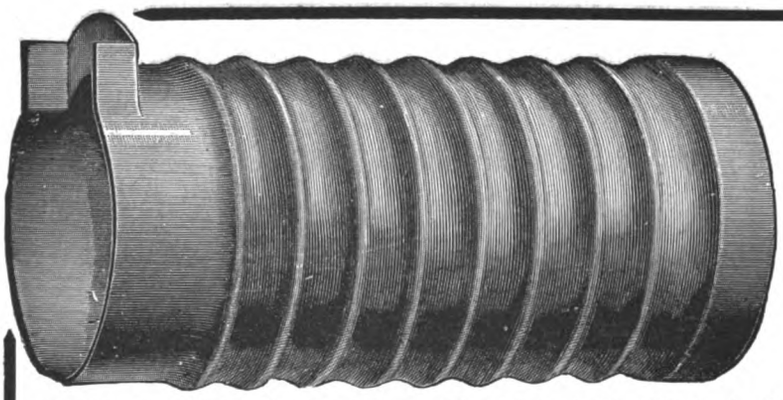

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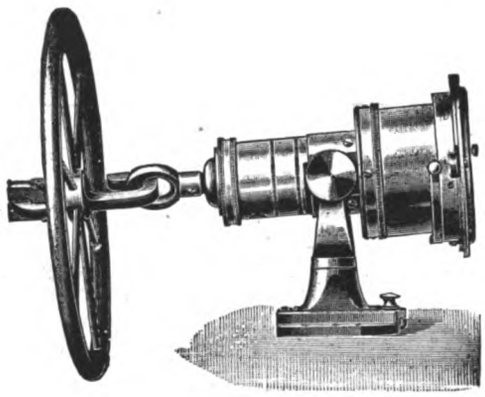

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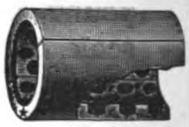

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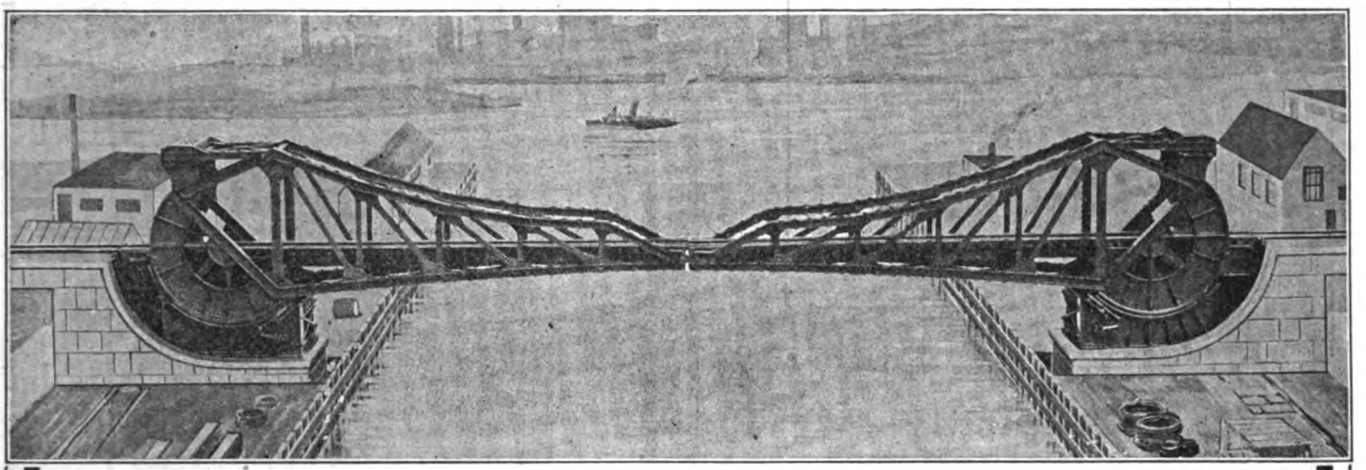

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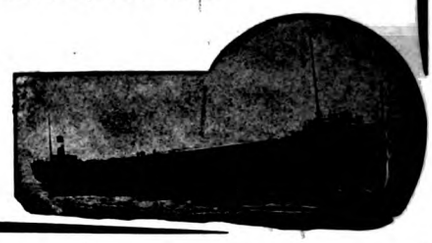

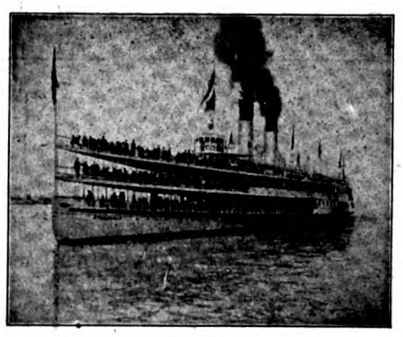

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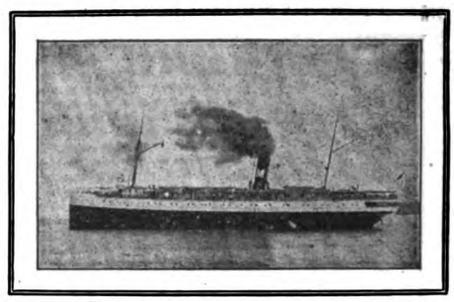

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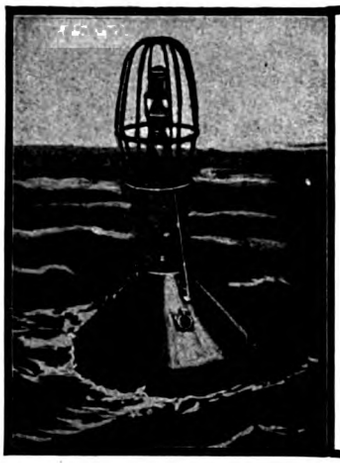

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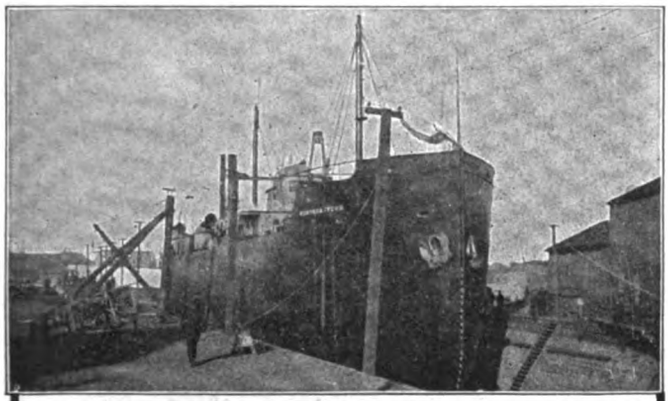

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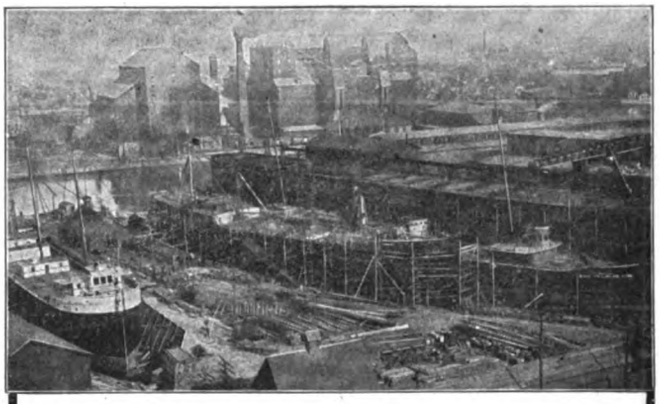

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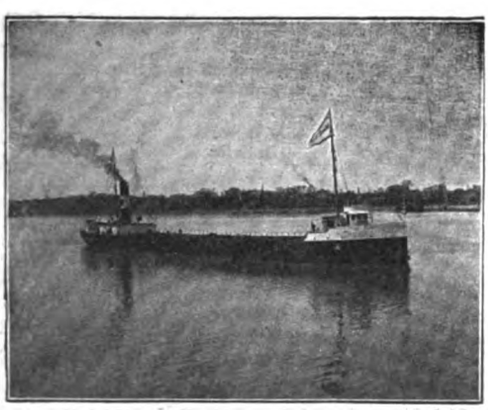

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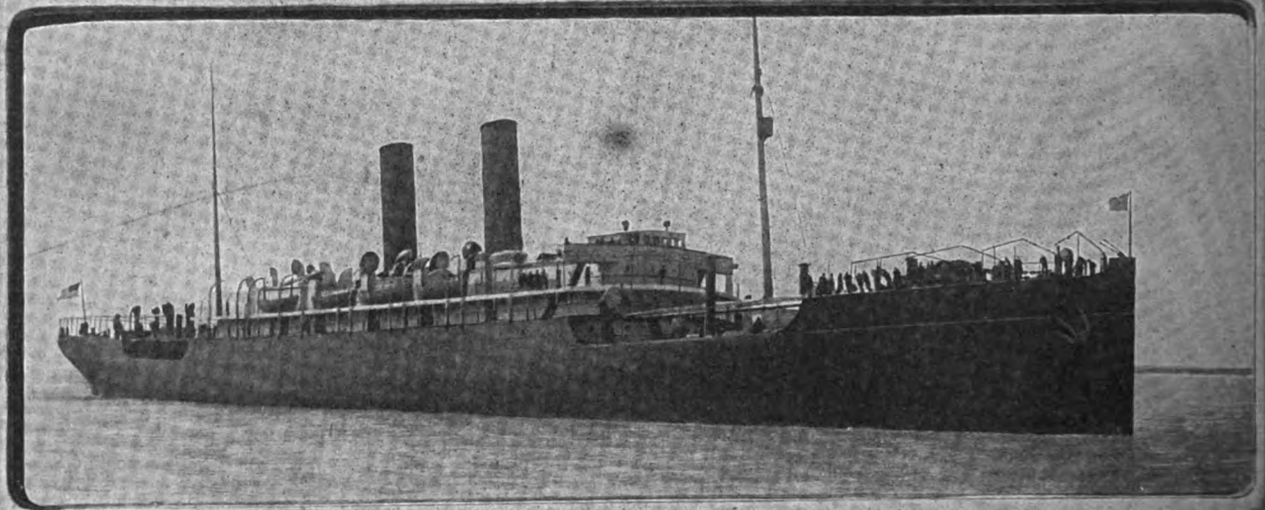

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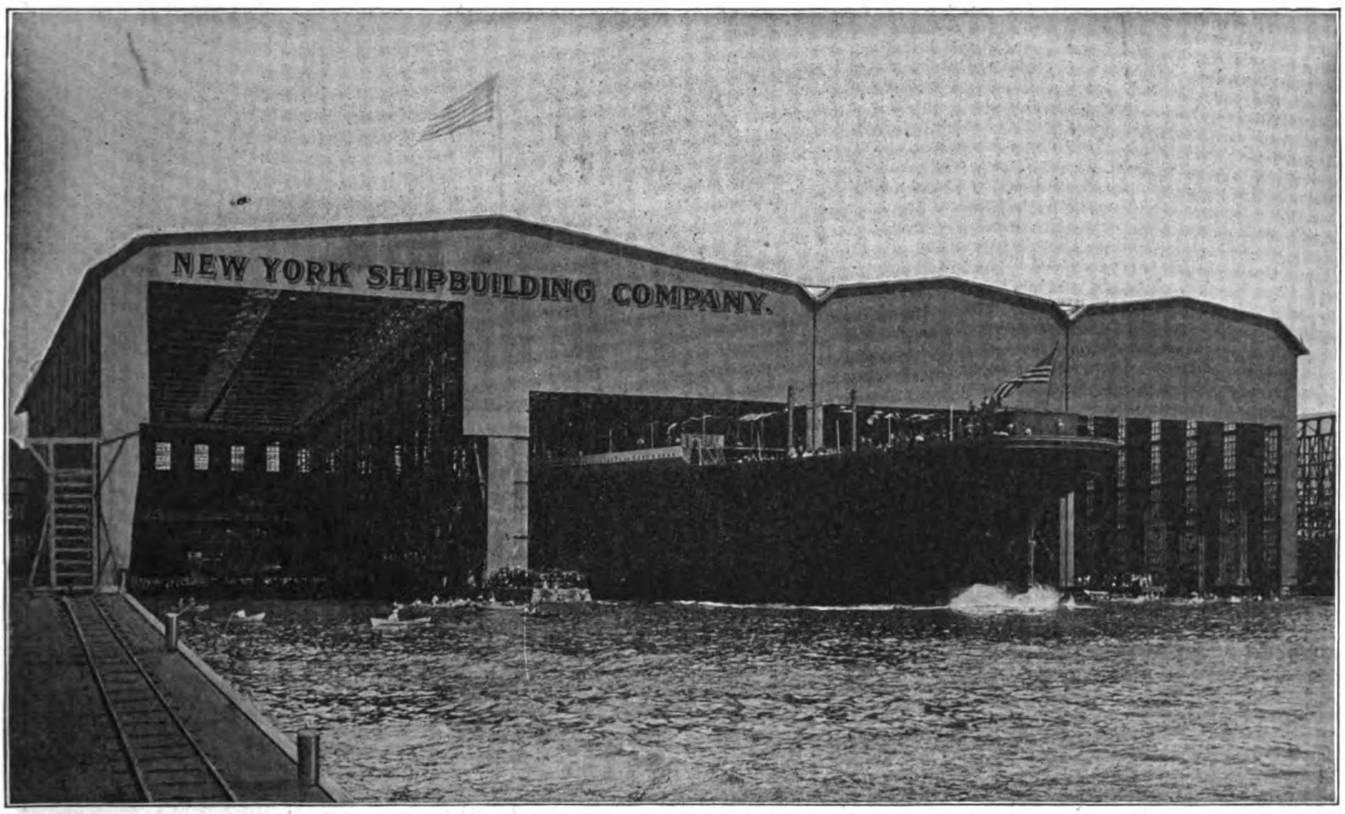

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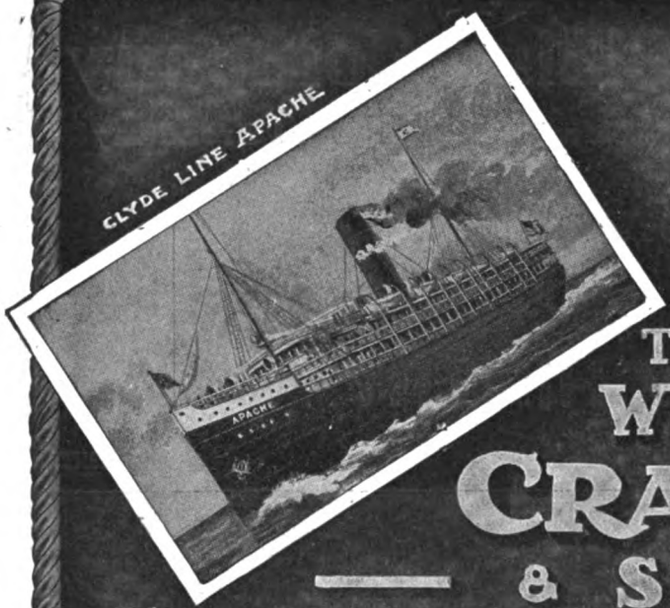

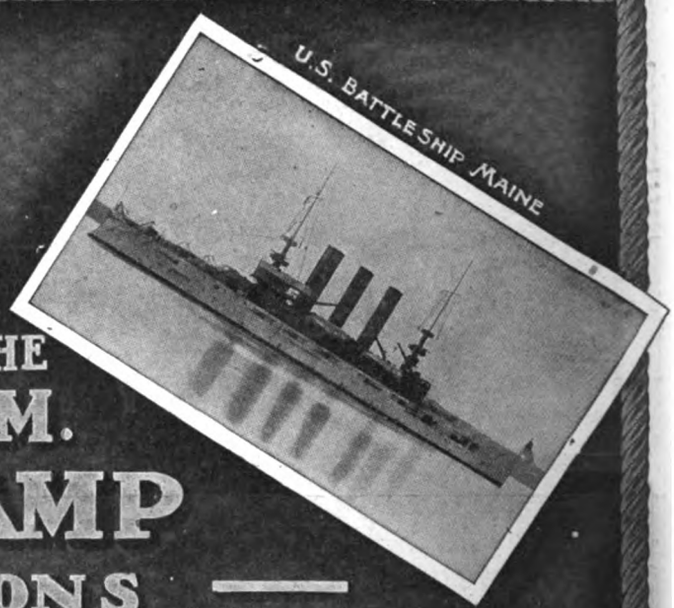

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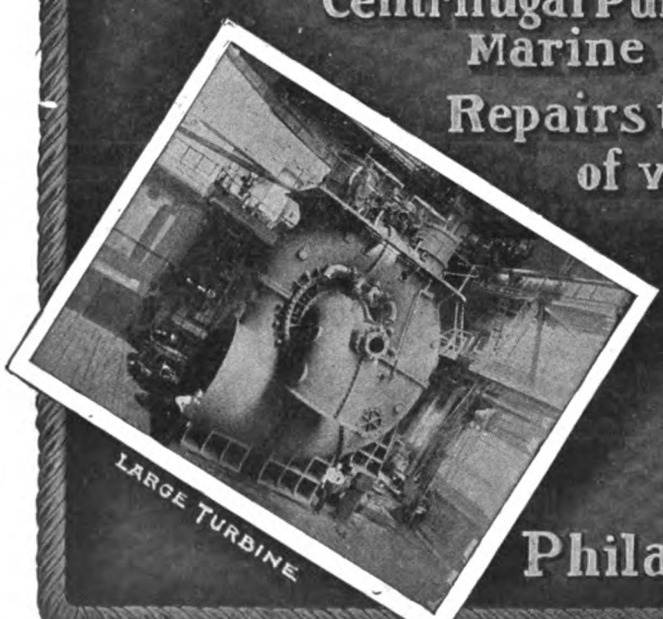

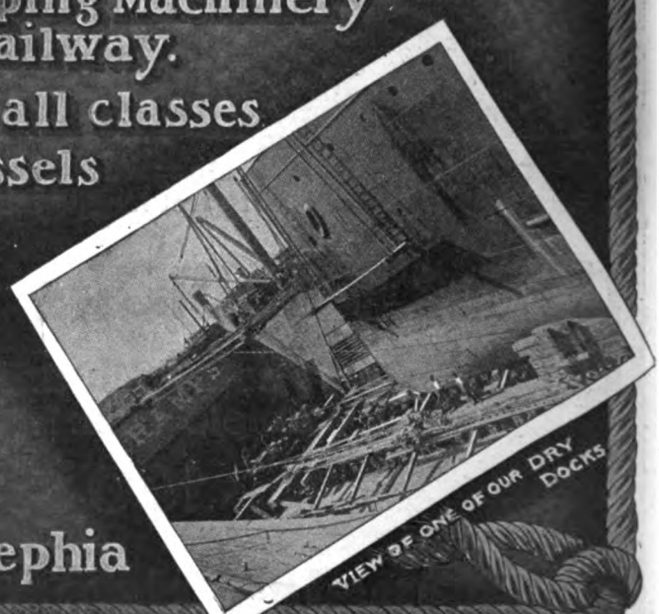

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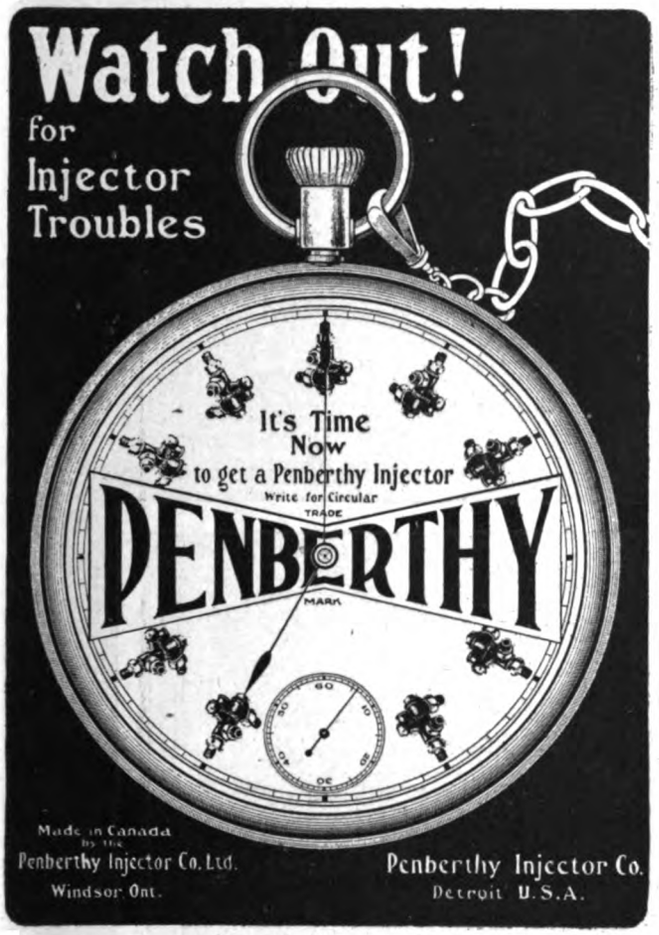

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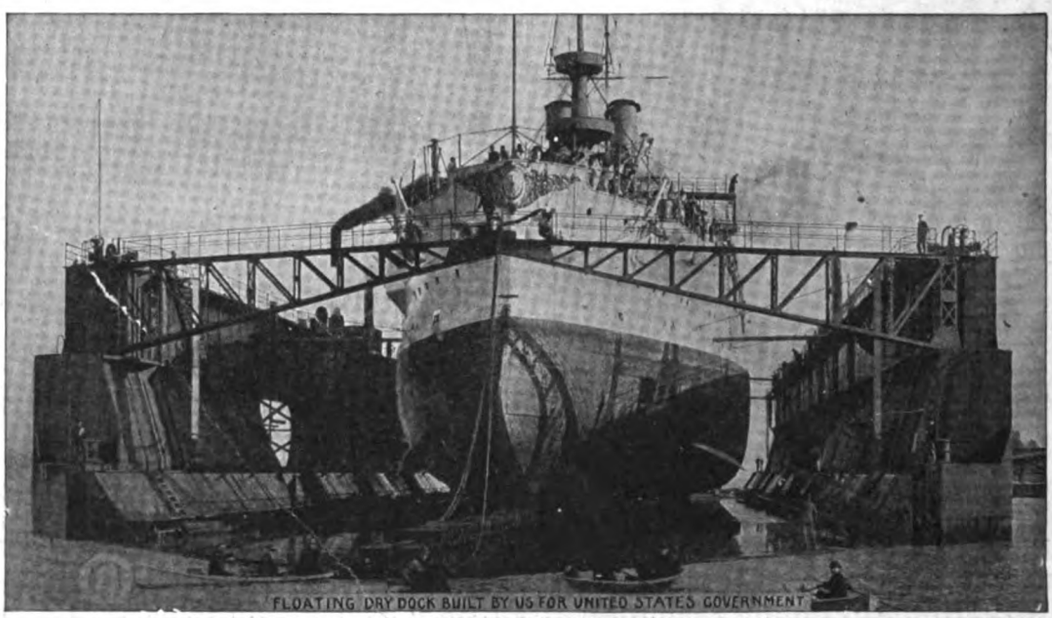

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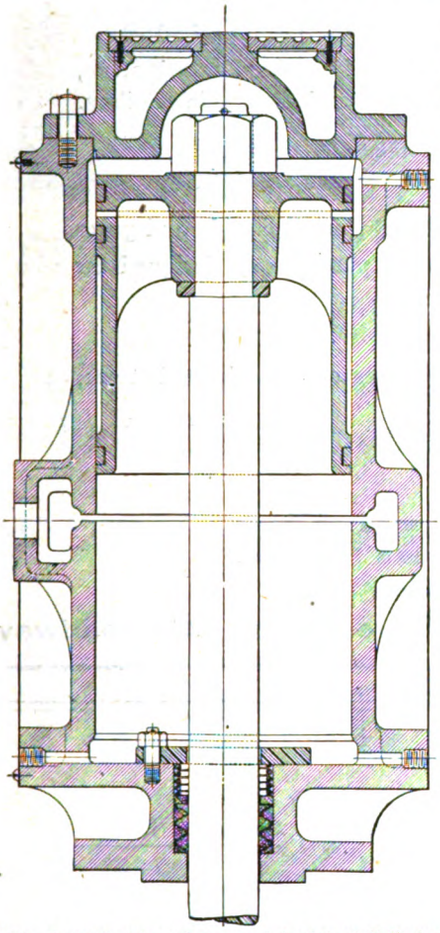

See papers read before Society of Naval Architects and Marine Engineers, Nov., 1902. Prize awarded for this article. Also see JOURNAL OF THE AMERICAN SOCIETY OF NAVAL ENGINEERS, Vol. XVI, No. 3. and Vol. XVII, No. 3.

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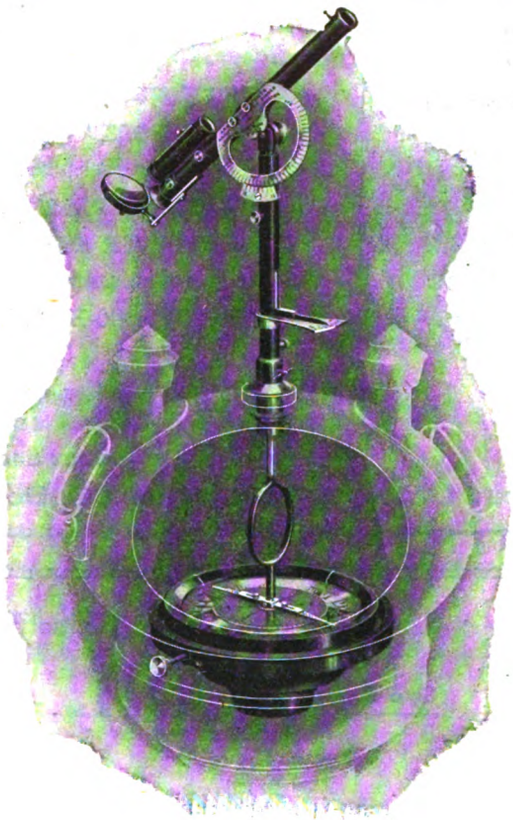

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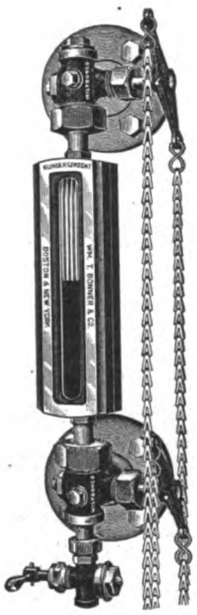

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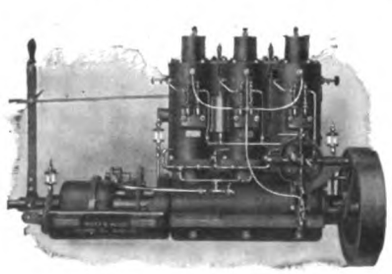

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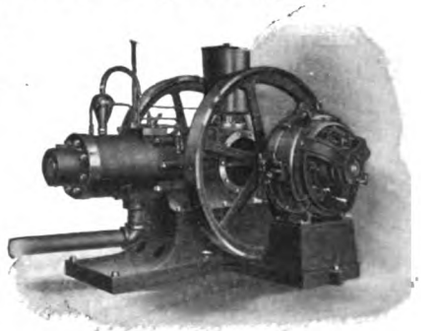

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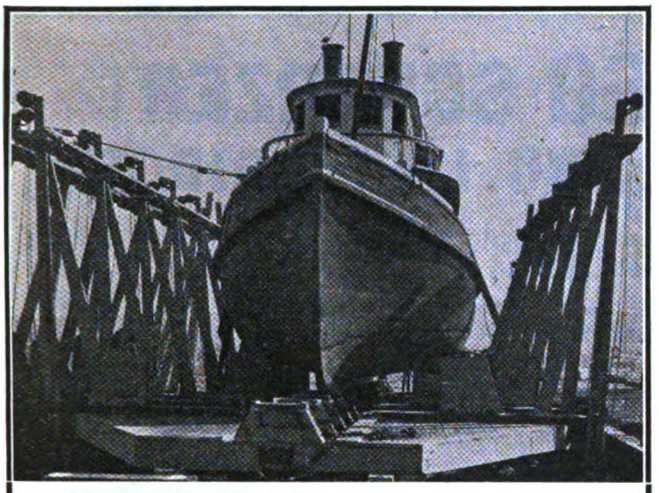

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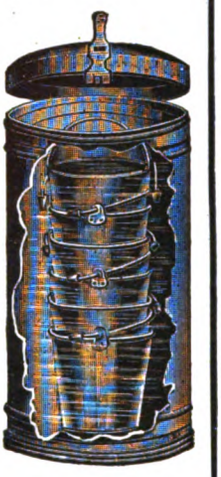

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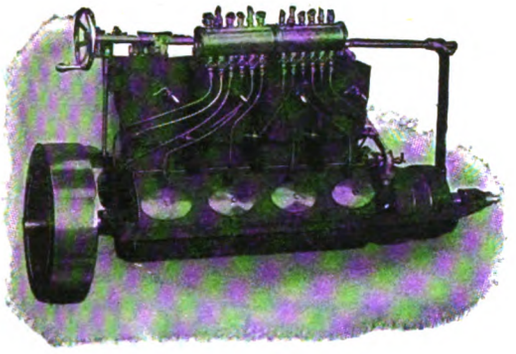

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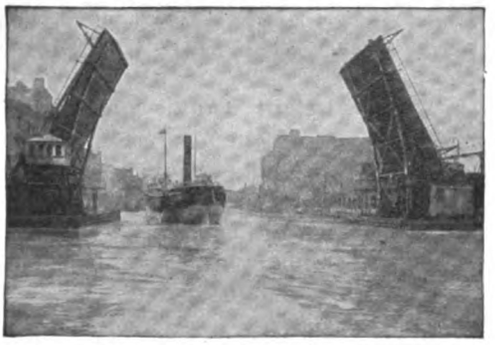

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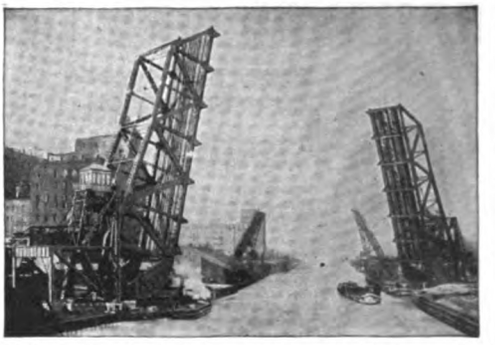

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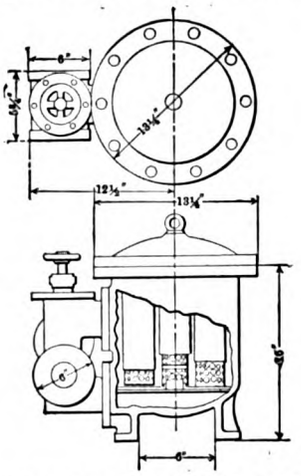

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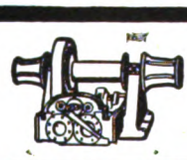

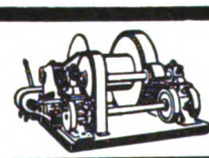

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Poe Lock, with Whaleback.
Whaleback Str. Pathfinder in the Locks.
St. Marys River, South from the Locks.
Weitzel Lock, from above.
Weitzel Lock, from below.
Str. North Land Passing Locks, two views.
Upper Entrance to Lock Canal.
Gate Mechanism.
Interior of Power House.
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Canadian Lock from Lower End.
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The Rapids, looking across.
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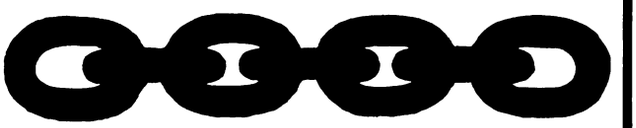

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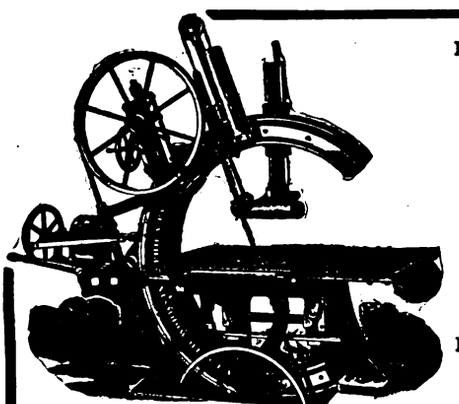

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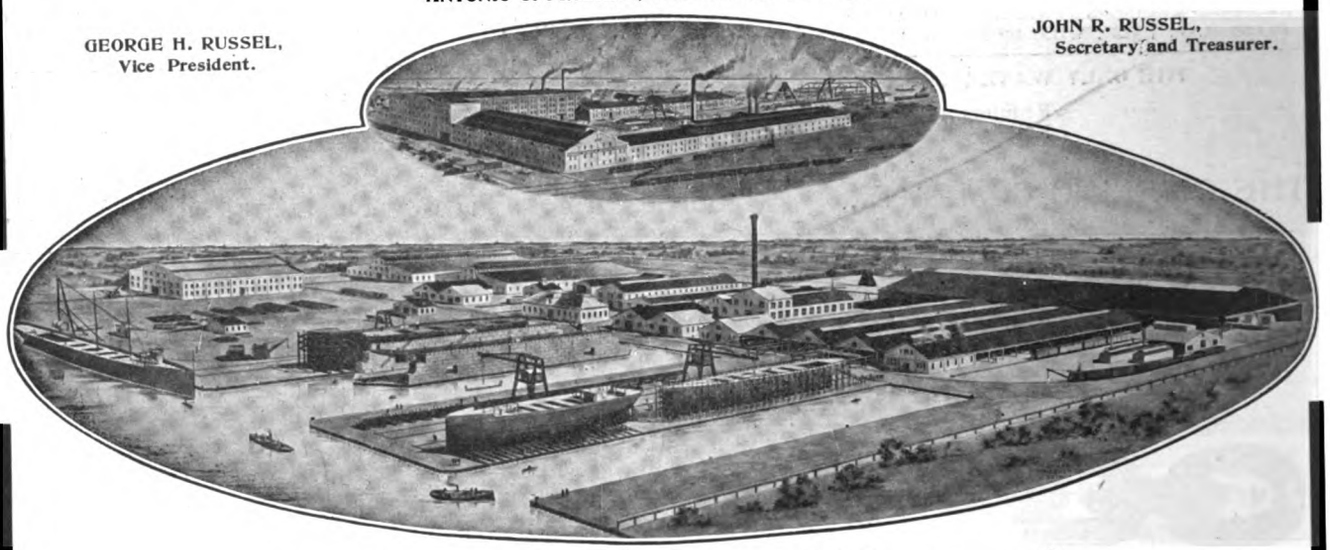

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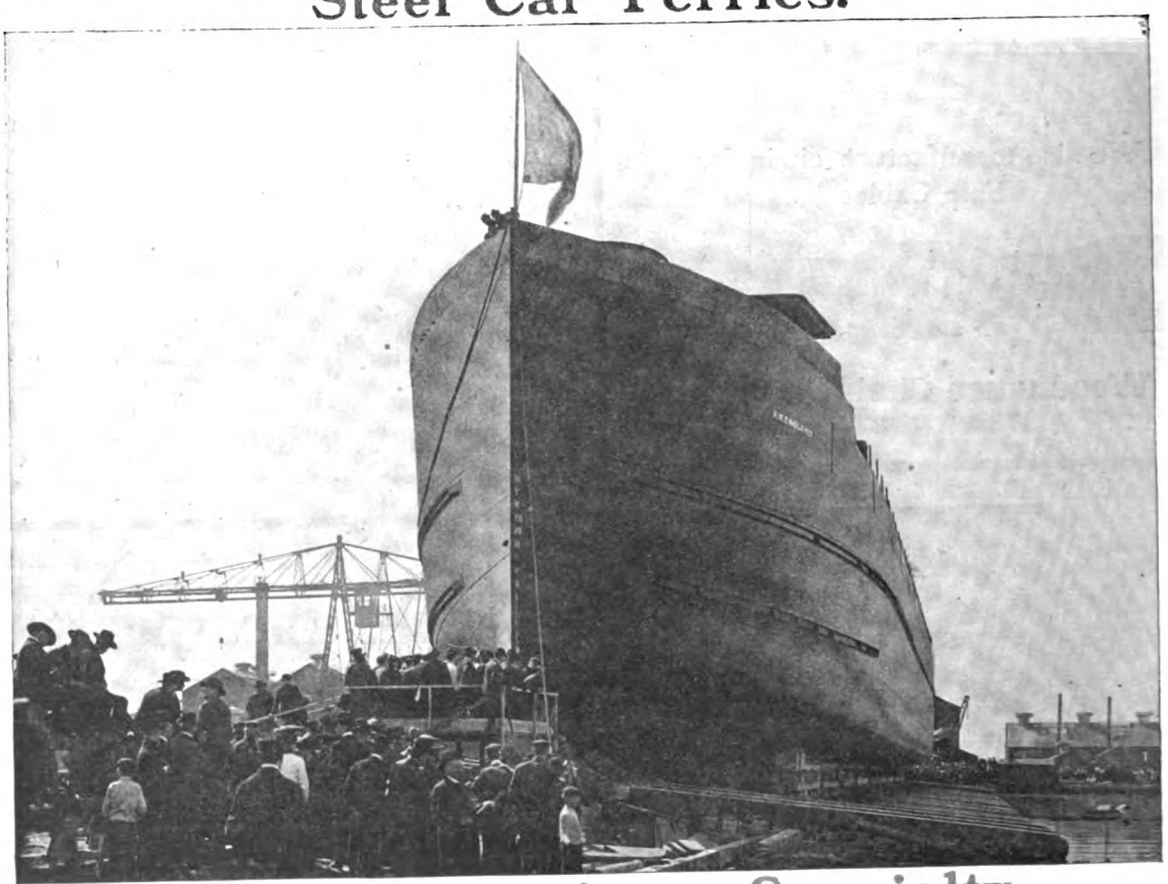

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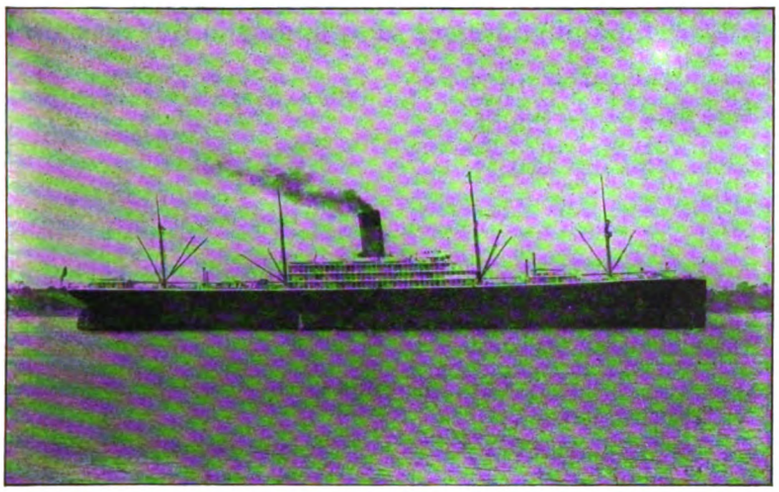

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See accompanying index of Advertisers for full addresses of concerns in this directory.

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Great Lakes Engineering Works.....Detroit.
Mietz, Aug. .....New York.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.

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Great Lakes Engineering Works.....Detroit
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ASH EJECTORS.
Great Lakes Engineering Works.....Detroit.

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Cleveland Block Co.....Cleveland.

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Sturtevant, B. F. Co.....Hyde Park, Mass.

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Kahnweiler's Sons, David.....New York.
Lane & DeGroot....Long Island City, N. Y.
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.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

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Power Specialty Co.....Detroit.

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Chicago Ship Building Co.....Chicago.
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Dearing Water Tube Boiler Co.....Detroit.
Delauney, Belleville & Co...St. Denis, France.
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East End Boiler Works.....Detroit.
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Great Lakes Engineering Works.....Detroit.
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Milwaukee Dry Dock Co.....Milwaukee.
Mosher Water Tube Boiler Co....New York.
Newport News Ship Building Co.....
.....Newport News, Va.

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Northwestern Steam Boiler & Mfg. Co....
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Quintard Iron Works Co.....New York.
Roberts Safety Water Tube Boiler Co....
.....New York.
Stirling, The Co.....New York.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.

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Bourne-Fuller Co.....Cleveland.

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Great Lakes Engineering Works.....Detroit.
Lunkenheimer Co.....Cincinnati.
Macbeth Iron Co.....Cleveland.

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Scherzer Rolling Lift Bridge Co.....Chicago.

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McMyler Mfg. Co.....Cleveland.

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"Long Arm" System Co.....Cleveland.

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Martin-Barriss Co.....Cleveland.

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Upson-Walton Co.....Cleveland.

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Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

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Smooth-On Mfg. Co.....Jersey City, N. J.

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Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.

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Brown Hoisting Machinery Co. (Inc.)....
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McMyler Mfg. Co.....Cleveland.

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Great Lakes Dredge & Dock Co.....Chicago.
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Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
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Armstrong Cork Co.....Pittsburg, Pa.
Kahnweiler's Sons, D.....New York.

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Brown Hoisting Machinery Co.....Cleveland.
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Sturtevant Co., B. F.....Hyde Park, Mass

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Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
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Great Lakes Dredge & Dock Co.....Chicago.
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Atlantic Works.....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.....
.....Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co....Superior, Wis.
Tietjen & Lang Dry Dock Co.....Hoboken, N. J.

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Manitowoc Dry Dock Co.....Manitowoc, Wis.

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General Electric Co.....Schenectady, N. Y.
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Sturtevant, B. F. & Co.....Hyde Park, Mass.
Thropp & Sons, John E.....Trenton, N. J.

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Thropp & Sons, John E.....Trenton, N. J.

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Detroit Ship Building Co.....Detroit.
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Marine Iron Works.....Chicago.
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Mosher, Chas. D.....New York.
Moulton Steering Engine Co.....New York.
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.....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
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Quintard Iron Works Co.....New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
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Lunkenheimer Co. .....Cincinnati, O.

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Chase Machine Co.....Cleveland.
General Electric Co.....New York.
Georgian Bay Engineering Works.....
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Hyde Windlass Co.....Bath, Me.
McMyler Mfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
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Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
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Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

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Walker & Sons, Thomas....Birmingham, Eng.
Also Ship Chandlers.

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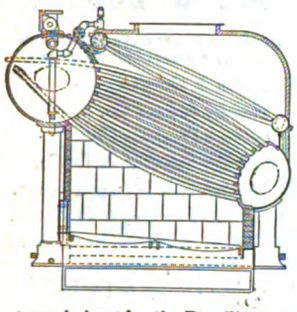

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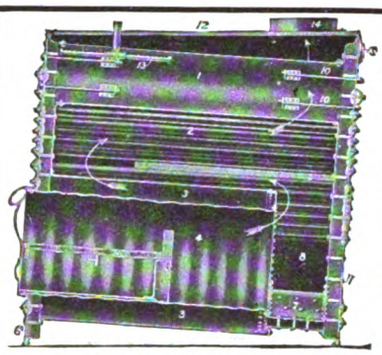

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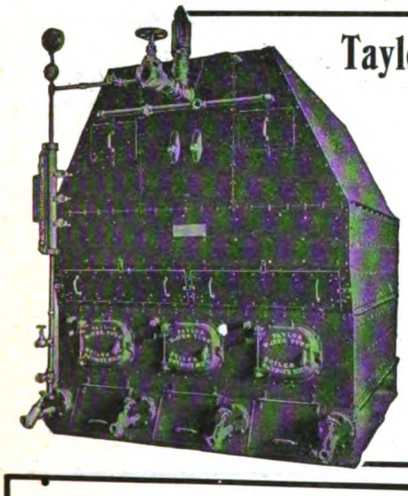

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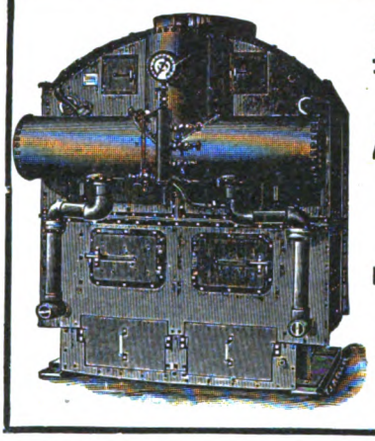

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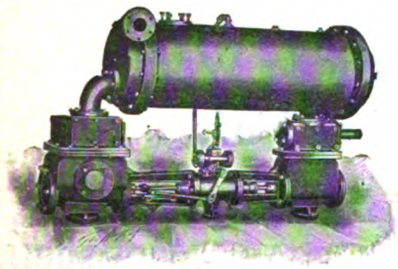

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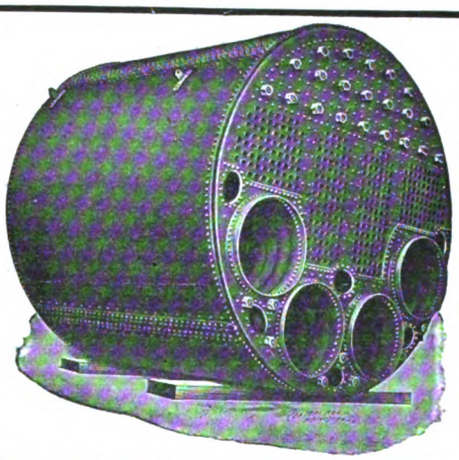

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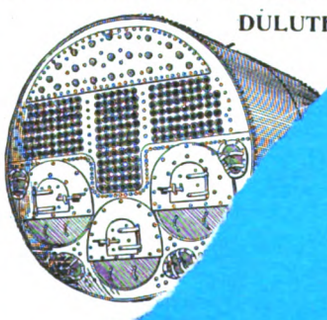

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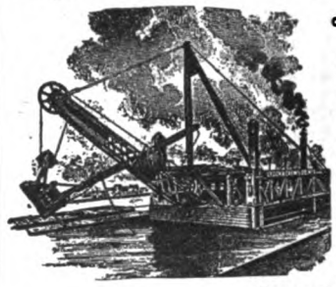

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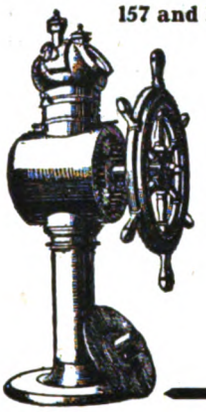
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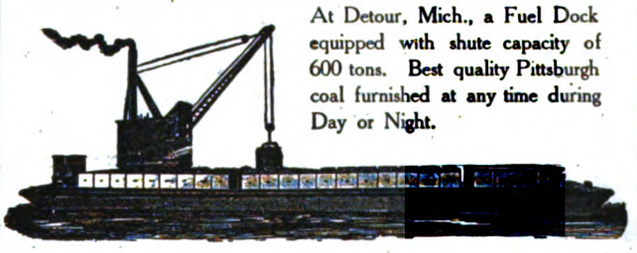
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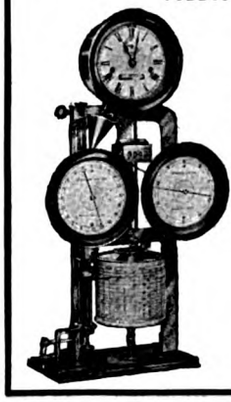

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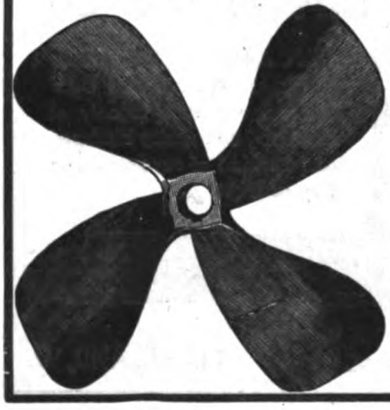

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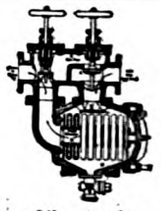

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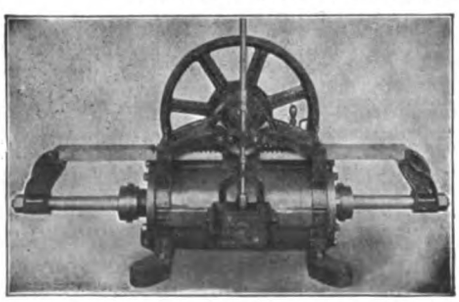

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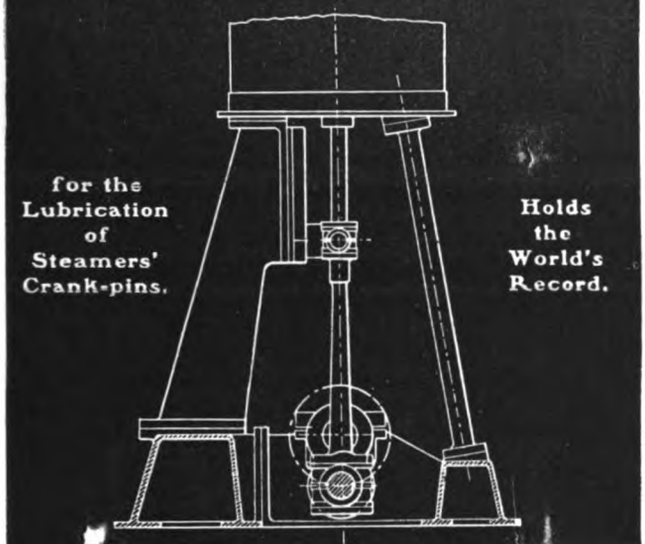

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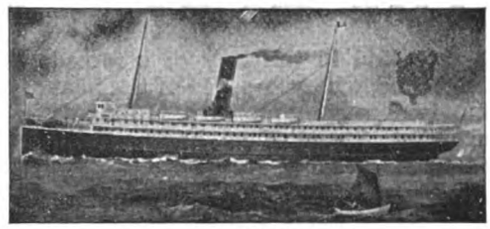

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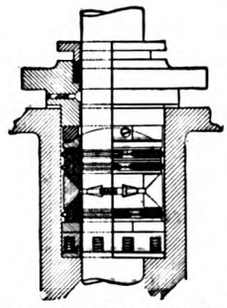

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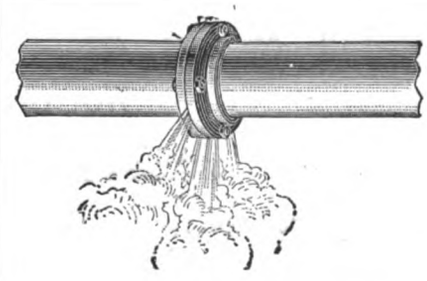

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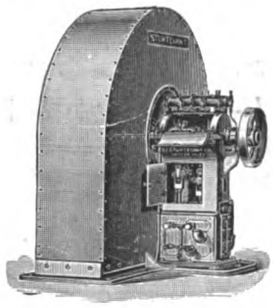

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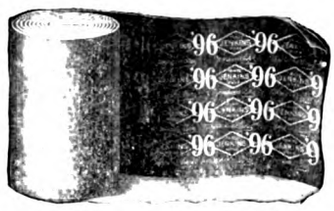

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